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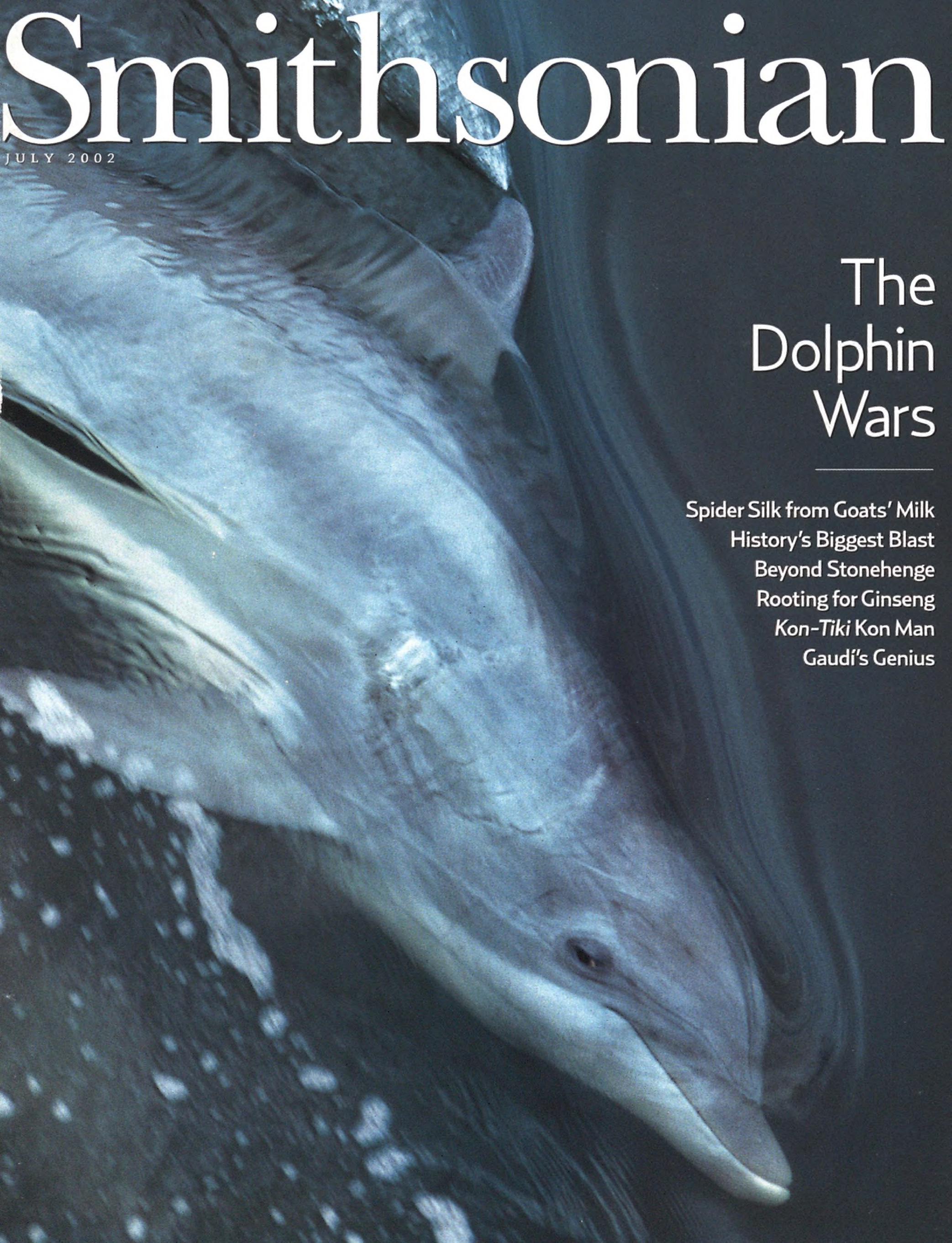

The Dolphin Wars

Spider Silk from Goats' Milk

History's Biggest Blast

Beyond Stonehenge

Rooting for Ginseng

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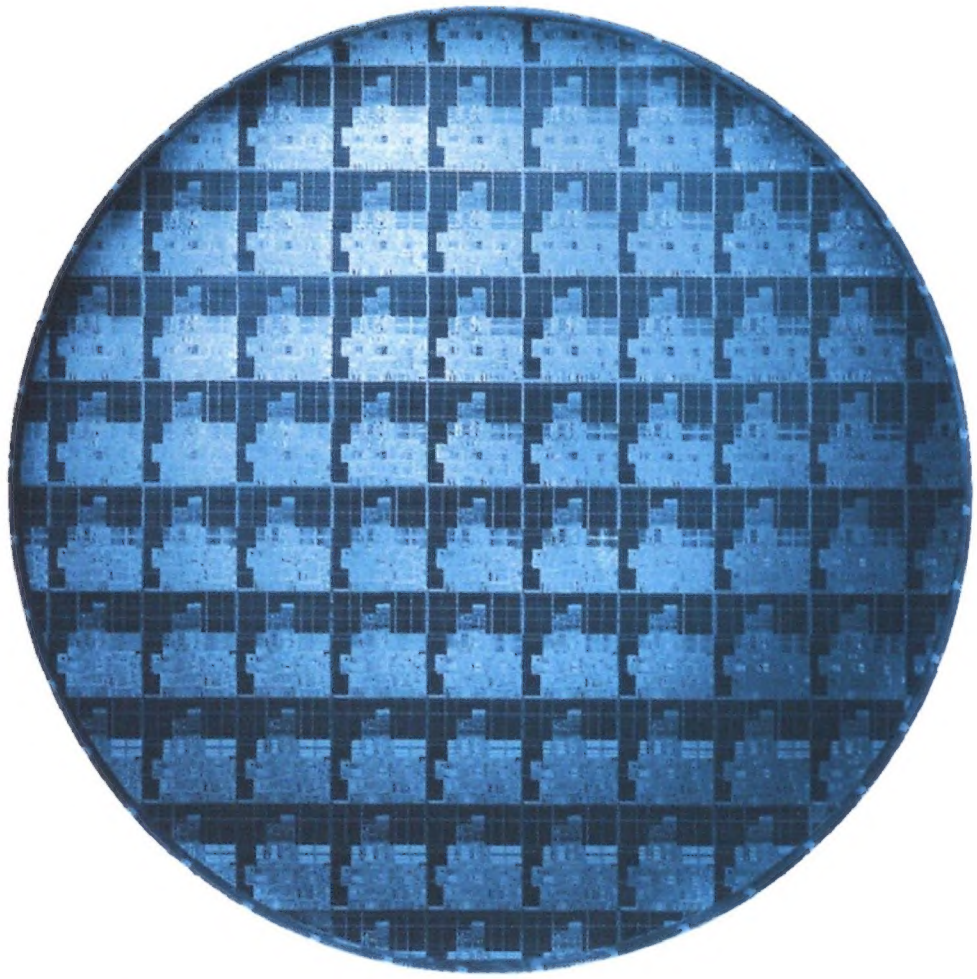

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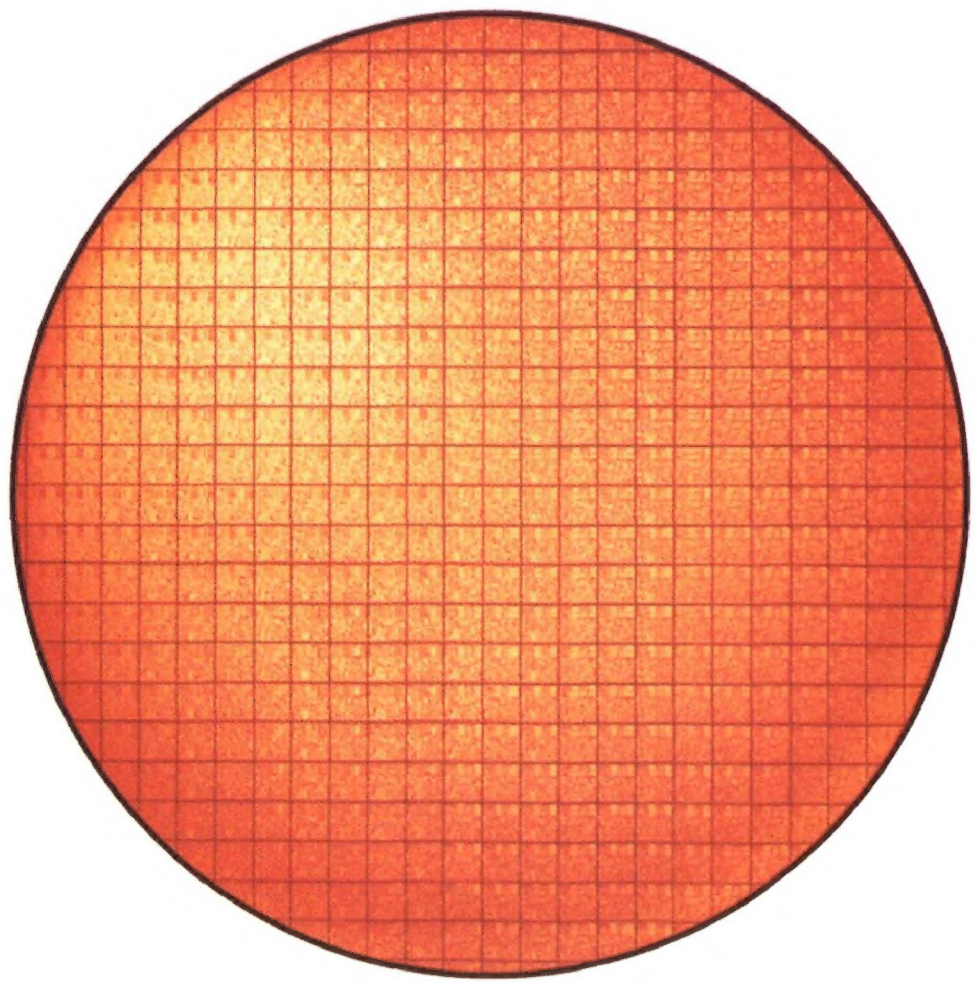

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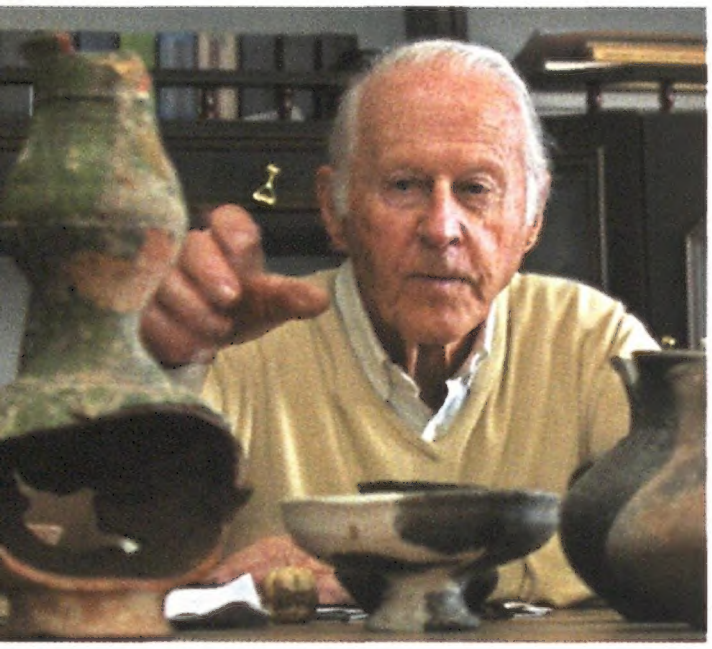

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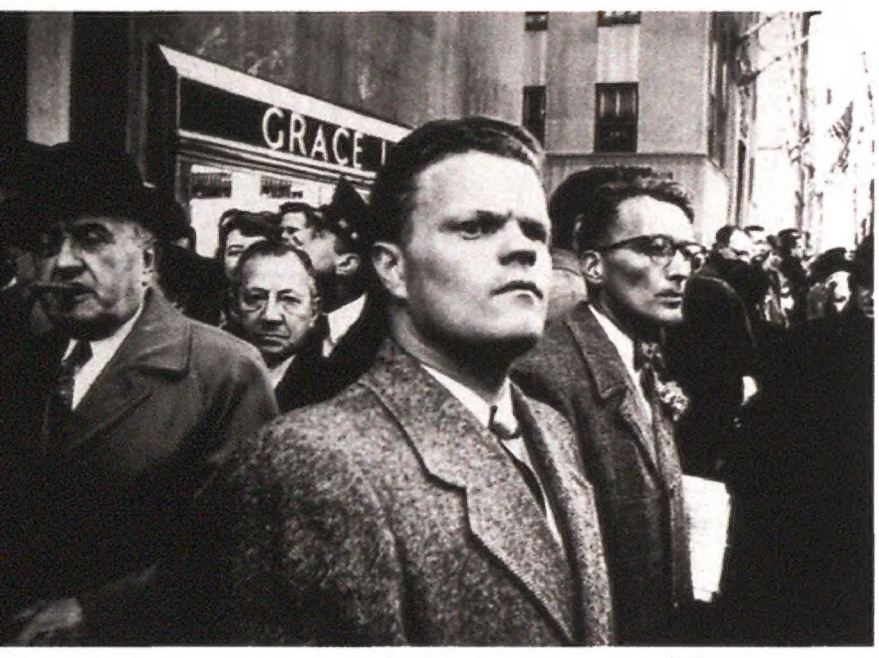

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From top: Thor Heyerdahl, 2001; Terry Walker and Johnny Downs celebrate the Fourth in this 1936 photo from Paramount Studios; William Klein's *Grace Line, 5th Avenue, New York*, 1955. **COVER: A bottlenose dolphin off the coast of Georgia. Photograph by Eric Horan.**

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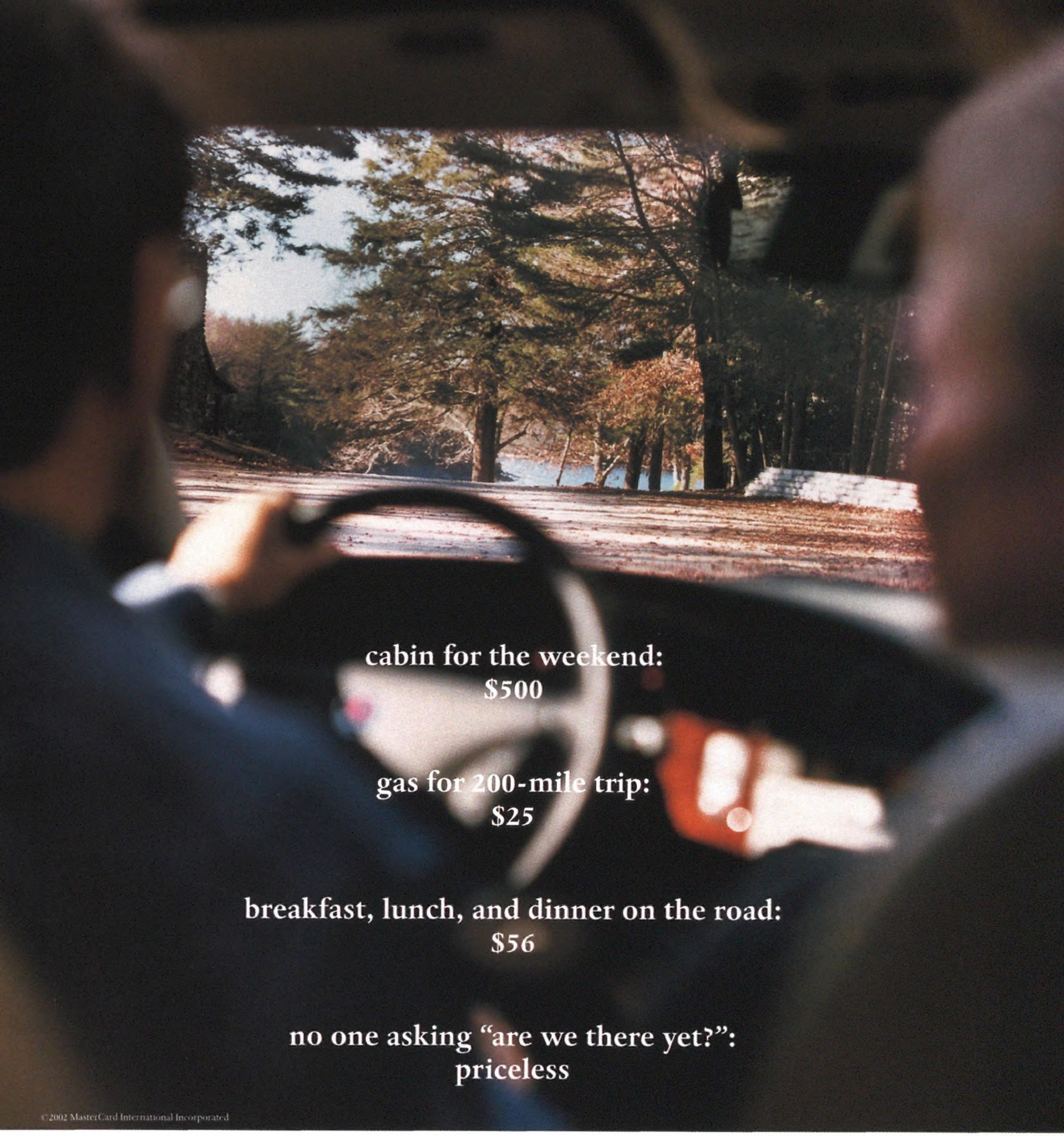

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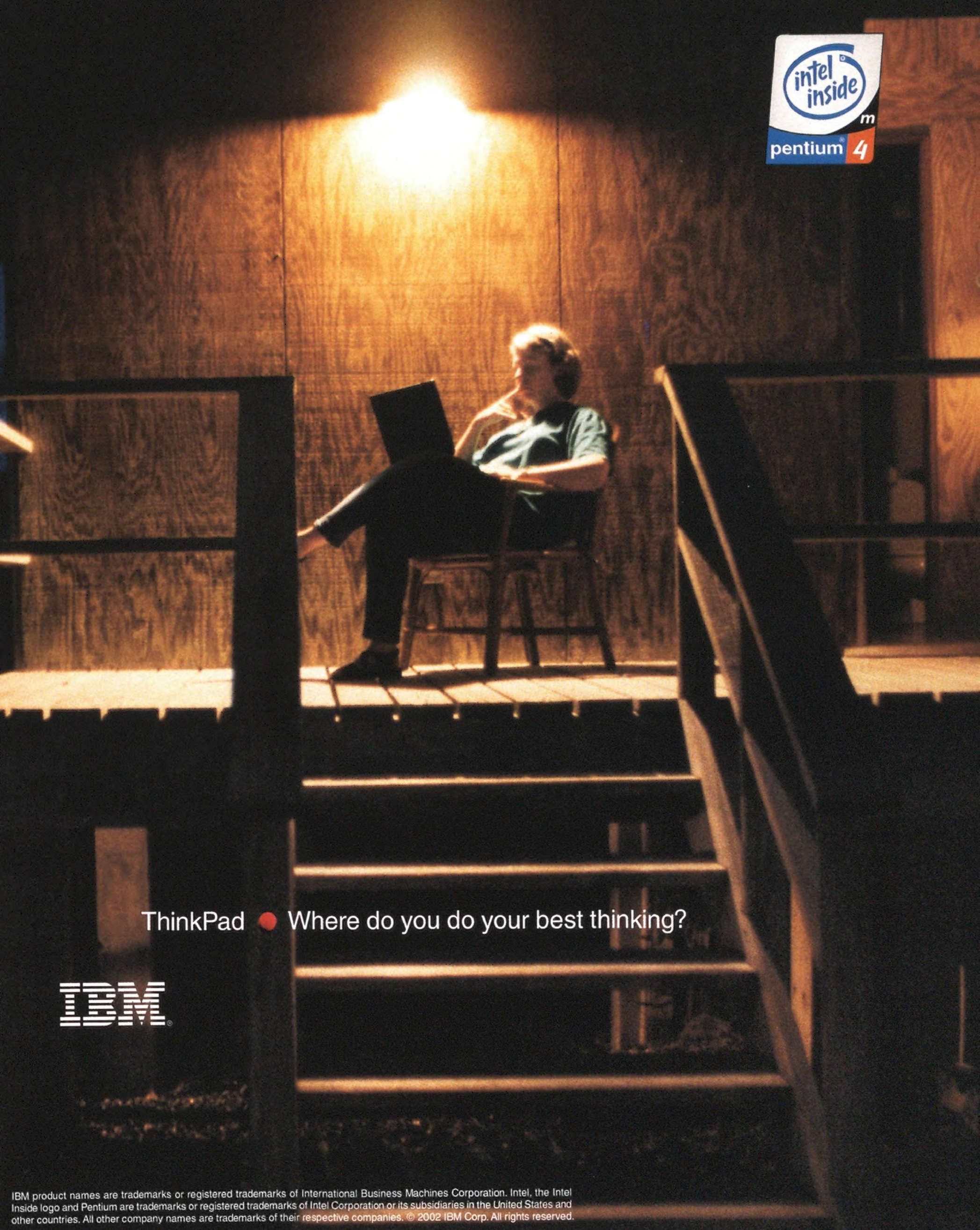

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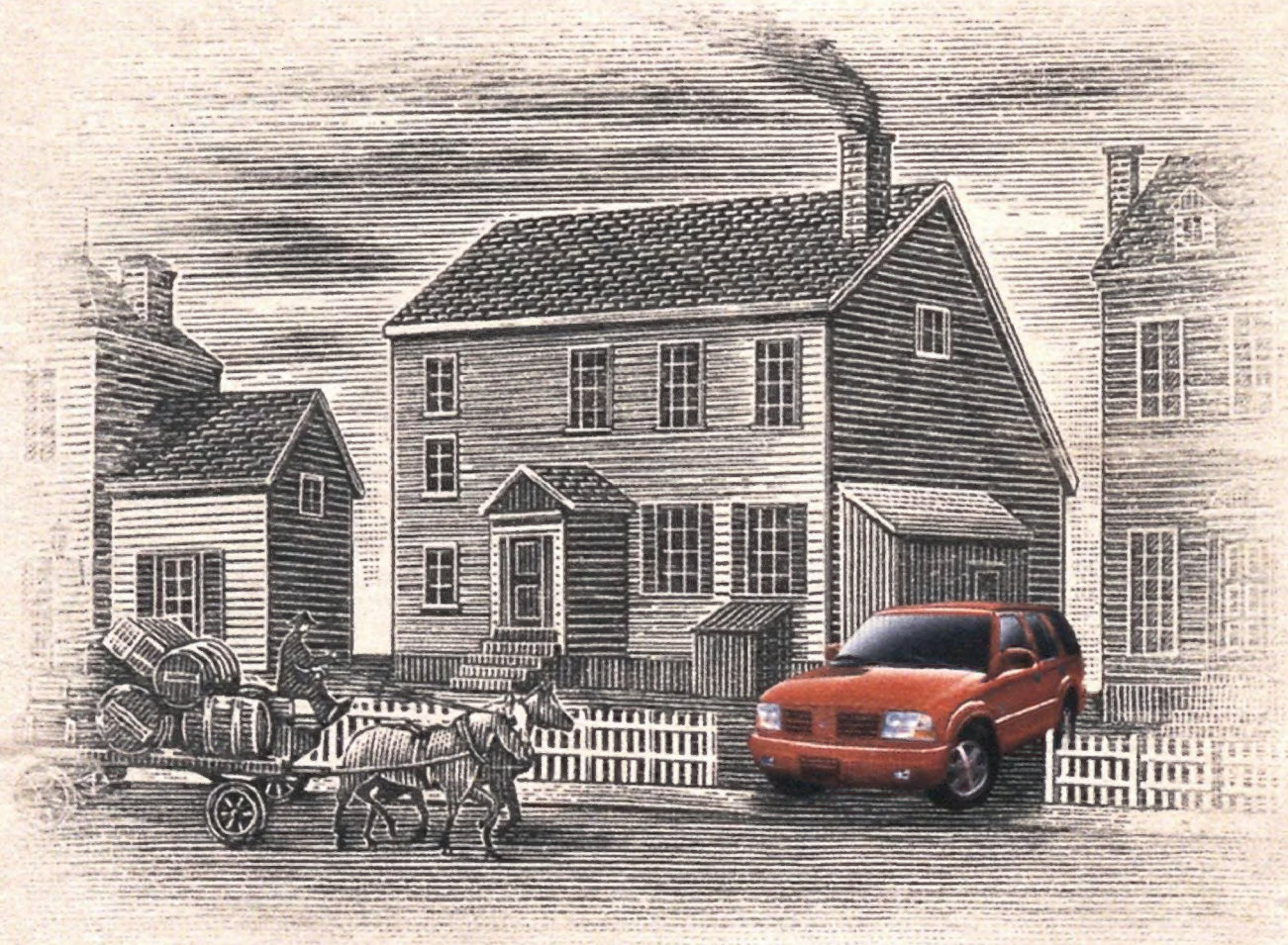

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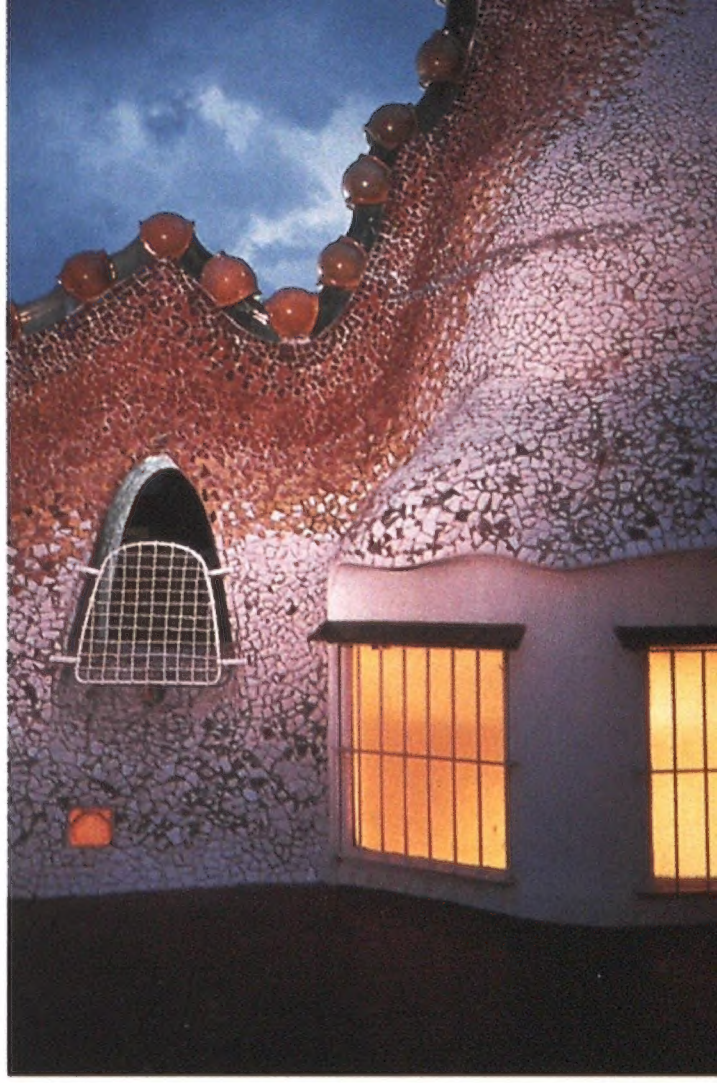

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From top: Known locally as the House of Bones, Casa Batlló was completed in 1906 by Antoni Gaudí; the Ring of Brodgar, Orkney Islands, Scotland; a scene from *Constant Star*, a play about Ida B. Wells.

TINO SORIANO; MACDUFF EVERTON; CAROL PRATT/ARENA STAGE

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EDITOR'S INKWELL

Stimulants

BOTH GINSENG AND DOLPHINS EVOKE PASSIONATE EMOTIONS

BY CAREY WINFREY, EDITOR

CLAUDIA GLENN DOWLING, WHO WROTE our cover story ("Incident at Big Pine Key"), was driving south from Miami toward Key West when a tractor-trailer in the oncoming lane suddenly jackknifed. It just missed her, and in Dowling's rearview mirror she saw the truck flip over in a cloud of dust and crash into several cars. Traffic in and out of the Keys was halted for hours. Journalism, she was reminded, is a craft full of close calls. "I have a friend reporting in Afghanistan and another in Israel right now, and I'm the one who almost gets killed," she says. "I thought I was doing a nice, safe story on dolphins. I guess all living creatures swim in perilous waters."

Dowling (mock-surfing in California): All creatures swim in perilous waters.

In 25 years of reporting and writing for *Life* and *People*, Dowling, 51, has climbed 21,000 feet up Mount Everest—"the easy part," she says—and canoed the Amazon. She has interviewed Presidents, including Bush *père* and Bush *fils*. And she reluctantly admits to being a coauthor of *The Bridges of Madison County: The Film*, a book, she notes, that "reads better in Japanese."

After interviewing eccentric, impassioned characters vying with one another for the rare privilege of handling wild dolphins in the Florida Keys, she reflected on the kinds of people who seem to gravitate to that funky, sunblasted string of connected islands. "Most of them seem to be fleeing something: the cold, their former lives," she says. "It's as if they ran as far south as they could get in the continental United States before getting stopped by the sea."

TO DAVID TAYLOR, AUTHOR OF THIS MONTH'S "GETTING TO THE ROOT OF Ginseng," one rendezvous with a source felt like something out of a John Grisham novel. David Cooke, a Boone County agriculture agent, had asked Taylor to meet him in a nondescript parking lot at a particular exit of Interstate 64 in West Virginia. There Taylor waited in his car for what seemed a long time, until a blue Ford pickup slowly entered the lot and approached Taylor's car. Finally, the driver got out, ambled over and introduced himself as Fred Hays, a ginseng grower. It was only then that Cooke showed up, and the three headed into the forest to find some "sang," as ginseng is known in those parts. Hays later explained the need for all the secrecy. "The way it is, if somebody finds out you got ginseng on your land, it disappears," he said. "It's like having money buried on your property."

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A Pantheon After All

FROM THE SECRETARY

WHEN PIERRE-CHARLES L'ENFANT DREW HIS VISIONARY plan for a capital city of the new United States in 1791, he included a site that might hold a pantheon, a hallowed place where the nation could honor its heroes. The pantheon was never constructed, but on the spot L'Enfant had designated for it, a great Greek Revival building began to rise some 45 years later. The building was home to the U.S. Patent Office, which recognized achievement of a kind no less vital to the success of the nation than the heroism L'Enfant had contemplated. The Patent Office recorded the genius of such figures as Thomas Edison, along with the industry of those who invented nothing more than a better clothespin. It became a temple to the practical American imagination in all of its unconstrained profusion. The building accommodated imagination of another kind as well: before there was a Smithsonian, the collection to which we trace our current extensive holdings of American art was displayed within its walls.

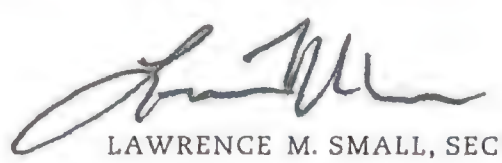
American ingenuity and art are honored at the former Patent Office.

By the late 1950s the building, long since vacated by the Patent Office, was in danger of being leveled, its storied presence to be traded for a parking garage. Instead, Congress authorized its use by the Smithsonian in 1958 to house the National Portrait Gallery and the American art museum. (The Patent Office building is now closed while undergoing a renovation, at a cost of some $216 million, that will reclaim for a new century the architectural glory of its past; during the renovation, prized items from the collections are touring the nation and the world.) The two museums could have no more appropriate home than within what Walt Whitman called the "noblest of Washington buildings," where, not incidentally, Abraham Lincoln danced at his second inaugural ball.

You might even say that the museums were destined for the site. Their separate missions echo the purpose L'Enfant had envisioned for the location; echo, too, the role of the Patent Office in tracking Americans' boundless ingenuity. The two museums have distinct purposes and yet together they limn the American experience by acknowledging the accomplishment of individual Americans in every realm of endeavor. The Smithsonian American Art Museum—with a collection that now numbers 39,000 works—recognizes the aesthetic achievement of American artists. The Portrait Gallery, by contrast, is not an art museum, though its collections include great works of art (a portrait of artist Mary Cassatt by Edgar Degas, for instance). It is, rather, a biography museum, where the history of America is told through the lives of the men and women who made it.

The immense cast of characters who crowd the halls of the Portrait Gallery, in paintings, sculpture, photographs, prints, posters and caricatures, all left their mark on the nation, for better and, sometimes, for worse. (Here are Presidents and Presidential assassins too.) Their importance is measured not by the artistic worth of the images that survive of them but by the significance of their actions. The American Art Museum celebrates the work of individual artists; the Gallery reflects a more diverse calibration of accomplishment by individual Americans. One is a monument to the power of biography to move, amuse, instruct, inspire; the other, to the power of art to do no less.

Of course, the Portrait Gallery and the American Art Museum are not the only Smithsonian museums to recognize the contributions of particular Americans. But they do so on a scale and in a setting that give their recognition a special force. They make of the building they occupy a great hall of individual American achievement. So Washington has a pantheon after all—different, perhaps, from the one L'Enfant had in mind, but right for a country whose history has been so much more tumultuous and encompassing than he could ever have foreseen.



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TO THE EDITOR

Readers respond to the May issue.

RANGING FAR AND WIDE

I ENJOYED "HOME ON THE RANGE," about the making of the PBS series *Frontier House*, but did you place the 21st-century pliers in the center of the table in the photograph on pages 42-43 to test whether we were paying attention to 19th-century American West authenticity?

Charles G. Gerard
Williamsburg, Virginia

Not us. The show's producers needed the participants to put up barbed wire fences in a hurry and feared they might hurt themselves using authentic 1880s tools. Ed.

WHODUNIT?

ERLE STANLEY GARDNER, THE creator of the fictional Perry Mason, is credited with the rediscovery of some of the ancient murals in the Baja Peninsula of Mexico ("Drawn from Prehistory"). Sensing the importance of what he saw there in the early 1960s, he went to Los Angeles and returned with UCLA anthropologist Clement Meighan, who confirmed Gardner's impression.

Kenneth D. Gardner, Jr.
Bridgeport, California

ANT-THROPOMORPHISM

WHY DO RESEARCHERS ASSUME THE world revolves around man's reasoning? In the story on leafcutter ants ("Small Matters"), scientist Ted Schultz says, "Thinking small opens up all kinds of possibilities." And yet he seems to go against his logic by thinking that ants and fungi have the mental capabilities to make choices or attempt to break chemical codes. This is not thinking small, but is more like a grand delusion.

Richard Langness
St. Louis, Missouri

JUST OUR LUCK

IN "WE SAW HIM LAND!" IT IS STATED that Charles Lindbergh's nickname Lucky was bestowed on him after his solo transatlantic flight. Yet a week before the feat, the *New York Times* reported that he was previously given the name "by his fellow pilots in the air mail service," presumably because he had bailed out of four out-of-control planes.

Mahlon A. Hamilton
Newton, New Jersey

MILLE CULPA

IN "A RALLY TO REMEMBER," ABOUT the Mille Miglia rally in Italy, the author writes: "Nearly a dozen drivers died, and the toll on cars was even worse." When did things become more important than people?

Craig Smith
Kansas City, Missouri

HEROES AND HEARTBREAK

HISTORIAN DIANA PRESTON'S CHILLING account of the ruthless attack on civilians aboard the ocean liner *Lusitania* ("Torpedoed!") brought tears to my eyes. It was a reminder of the heroism of such folks as Alfred Vanderbilt, who died after giving his life jacket to a woman though he couldn't swim—a tribute to the commandment to "love thy neighbor as thy self." It's a pity beyond words that the same kind of selfless heroism was called for—and provided—on September 11, 2001.

Cindy Hart
Santa Barbara, California

A TRAGEDY SIMILAR TO THE ATTACK on the *Lusitania* befell a German ship at the end of World War II. Named the *Wilhelm Gustloff*, she was overloaded with refugees from the eastern German provinces, soldiers and wounded. On January 30, 1945, she was torpedoed by a Soviet submarine. Most estimates put the number of lives lost at 7,000 to 10,000—probably the worst maritime disaster in history. In the case of both tragedies I'm afraid that the root cause, as usual, was the idiocy known as war.

Denis Hutchings
River Forest, Illinois

In our introduction to the *Lusitania* book excerpt, we somehow managed to double the number of torpedoes fired by the attacking German submarine. In her book *Lusitania: An Epic Tragedy*, author Diana Preston documents that the submarine fired only one. Ed.

Send letters for this column to LettersEd@simag.si.edu or to **Letters Editor, SMITHSONIAN, MRC 951, P.O. Box 37012, Washington, D.C. 20013-7012.** Please include your telephone number and address. Letters may be edited for clarity and length. Send queries and comments about the Smithsonian Institution to info@info.si.edu or to VIARC, Public Inquiry Mail Service, P.O. Box 37012, Washington, D.C. 20013-7012.

Make an easier Change

Nasal allergies can be so frustrating, you feel like moving to a place without pollen, trees, or a single blade of grass.

Of course, you would never go to these extremes. But before you change your life, maybe you should make an easier change. Ask your doctor about FLONASE.

Using multi-symptom FLONASE Nasal Spray once a day can relieve all these nasal allergy symptoms — congestion, sneezing, and itchy, runny nose — all day and night. Results may vary.

If side effects occur, they are generally mild and may include headache, nosebleed, or sore throat. For best results, use daily. Maximum relief may take several days. Available by prescription only.

Ask your doctor about multi-symptom FLONASE, or call 1-800-FLONASE, or visit www.flonase.com.

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Nasal Spray, 50 mcg

BRIEF SUMMARY

SHAKE GENTLY BEFORE USE.

For Intranasal Use Only.

The following is a brief summary only; see full prescribing information for complete product information.

CONTRAINDICATIONS: FLONASE Nasal Spray is contraindicated in patients with a hypersensitivity to any of its ingredients.

WARNINGS: The replacement of a systemic corticosteroid with a topical corticosteroid can be accompanied by signs of adrenal insufficiency, and in addition some patients may experience symptoms of withdrawal, e.g., joint and/or muscular pain, lassitude, and depression. Patients previously treated for prolonged periods with systemic corticosteroids and transferred to topical corticosteroids should be carefully monitored for acute adrenal insufficiency in response to stress. In those patients who have asthma or other clinical conditions requiring long-term systemic corticosteroid treatment, too rapid a decrease in systemic corticosteroids may cause a severe exacerbation of their symptoms.

The concomitant use of intranasal corticosteroids with other inhaled corticosteroids could increase the risk of signs or symptoms of hypercorticism and/or suppression of the HPA axis.

Patients who are on immunosuppressant drugs are more susceptible to infections than healthy individuals. Chickenpox and measles, for example, can have a more serious or even fatal course in patients on immunosuppressant doses of corticosteroids. In such patients who have not had these diseases, particular care should be taken to avoid exposure. How the dose, route, and duration of corticosteroid administration affects the risk of developing a disseminated infection is not known. The contribution of the underlying disease and/or prior corticosteroid treatment to the risk is also not known. If exposed to chickenpox, prophylaxis with varicella zoster immune globulin (VZIG) may be indicated. If exposed to measles, prophylaxis with pooled intramuscular immunoglobulin (IG) may be indicated. (See the respective package inserts for complete VZIG and IG prescribing information.) If chickenpox develops, treatment with antiviral agents may be considered.

PRECAUTIONS:

General: Rarely, immediate hypersensitivity reactions or contact dermatitis may occur after the administration of FLONASE Nasal Spray. Rare instances of wheezing, nasal septum perforation, cataracts, glaucoma, and increased intraocular pressure have been reported following the intranasal application of corticosteroids, including fluticasone propionate.

Use of excessive doses of corticosteroids may lead to signs or symptoms of hypercorticism, suppression of HPA function, and/or reduction of growth velocity in children or teenagers. Physicians should closely follow the growth of children and adolescents taking corticosteroids, by any route, and weigh the benefits of corticosteroid therapy against the possibility of growth suppression if growth appears slowed.

Although systemic effects have been minimal with recommended doses of FLONASE Nasal Spray, potential risk increases with larger doses. Therefore, larger than recommended doses of FLONASE Nasal Spray should be avoided.

When used at higher than recommended doses, or in rare individuals at recommended doses, systemic corticosteroid effects such as hypercorticism and adrenal suppression may appear. If such changes occur, the dosage of FLONASE Nasal Spray should be discontinued slowly consistent with accepted procedures for discontinuing oral corticosteroid therapy.

In clinical studies with fluticasone propionate administered intranasally, the development of localized infections of the nose and pharynx with *Candida albicans* has occurred only rarely. When such an infection develops, it may require treatment with appropriate local therapy and discontinuation of treatment with FLONASE Nasal Spray. Patients using FLONASE Nasal Spray over several months or longer should be examined periodically for evidence of *Candida* infection or other signs of adverse effects on the nasal mucosa.

FLONASE Nasal Spray should be used with caution, if at all, in patients with active or quiescent tuberculous infection; untreated local or systemic fungal or bacterial, or systemic viral infections or parasitic infection; or ocular herpes simplex.

Because of the inhibitory effect of corticosteroids on wound healing, patients who have experienced recent nasal septal ulcers, nasal surgery, or nasal trauma should not use a nasal corticosteroid until healing has occurred.

Information for Patients: Patients being treated with FLONASE Nasal Spray should receive the following information and instructions. This information is intended to aid them in the safe and effective use of this medication. It is not a disclosure of all possible adverse or intended effects.

Patients should be warned to avoid exposure to chickenpox or measles and, if exposed, to consult their physician without delay.

Patients should use FLONASE Nasal Spray at regular intervals as directed since its effectiveness depends on its regular use. A decrease in nasal symptoms may occur as soon as 12 hours after starting therapy with FLONASE Nasal Spray. Results in several clinical trials indicate statistically significant improvement within the first day or two of treatment; however, the full benefit of FLONASE Nasal Spray may not be achieved until treatment has been administered for several days. The patient should not increase the prescribed dosage but should contact the physician if symptoms do not improve or if the condition worsens. For the proper use of the nasal spray and to attain maximum improvement, the patient should read and follow carefully the accompanying patient's instructions.

Drug Interactions: In a placebo-controlled, crossover study in 8 healthy volunteers, coadministration of a single dose of orally inhaled fluticasone propionate (1000 mcg, 5 times the maximum daily intranasal dose) with multiple doses of ketoconazole (200 mg) to steady state resulted in increased mean fluticasone propionate concentrations, a reduction in plasma cortisol AUC, and no effect on urinary excretion of cortisol. This interaction may be due to an inhibition of the cytochrome P450 3A4 isoenzyme system by ketoconazole, which is also the route of metabolism of fluticasone propionate. No drug interaction studies have been conducted with FLONASE Nasal Spray; however, care should be exercised when fluticasone propionate is coadministered with long-term ketoconazole and other known cytochrome P450 3A4 inhibitors.

Carcinogenesis, Mutagenesis, Impairment of Fertility: Fluticasone propionate demonstrated no tumorigenic potential in mice at oral doses up to 1000 mcg/kg (approximately 20 times the maximum recommended daily intranasal dose in adults and approximately 10 times the maximum recommended daily intranasal dose in children on a mcg/m² basis) for 78 weeks or in rats at inhalation doses up to 57 mcg/kg (approximately 2 times the maximum recommended daily intranasal dose in adults and approximately equivalent to the maximum recommended daily intranasal dose in children on a mcg/m² basis) for 104 weeks.

Fluticasone propionate did not induce gene mutation in prokaryotic or eukaryotic cells in vitro. No significant clastogenic effect was seen in cultured human peripheral lymphocytes in vitro or in the mouse micronucleus test when administered at high doses by the oral or subcutaneous routes. Furthermore, the compound did not delay erythroblast division in bone marrow.

No evidence of impairment of fertility was observed in reproductive studies conducted in male and female rats at subcutaneous doses up to 50 mcg/kg (approximately 2 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis). Prostate weight was significantly reduced at a subcutaneous dose of 50 mcg/kg.

Pregnancy: ***Teratogenic Effects:*** Pregnancy Category C. Subcutaneous studies in the mouse and rat at 45 and 100 mcg/kg, respectively (approximately equivalent to and 4 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis, respectively) revealed fetal toxicity characteristic of potent corticosteroid compounds, including embryonic growth retardation, omphalocele, cleft palate, and retarded cranial ossification.

In the rabbit, fetal weight reduction and cleft palate were observed at a subcutaneous dose of 4 mcg/kg (less than the maximum recommended daily intranasal dose in adults on a mcg/m² basis).

However, no teratogenic effects were reported at oral doses up to 300 mcg/kg (approximately 25 times the maximum recommended daily intranasal dose in adults on a mcg/m² basis) of fluticasone propionate to the rabbit. No fluticasone propionate was detected in the plasma in this study, consistent with the established low

bioavailability following oral administration (see CLINICAL PHARMACOLOGY section of full prescribing information).

Fluticasone propionate crossed the placenta following oral administration of 100 mcg/kg to rats or 300 mcg/kg to rabbits (approximately 4 and 25 times, respectively, the maximum recommended daily intranasal dose in adults on a mcg/m² basis).

There are no adequate and well-controlled studies in pregnant women. Fluticasone propionate should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Experience with oral corticosteroids since their introduction in pharmacologic, as opposed to physiologic, doses suggests that rodents are more prone to teratogenic effects from corticosteroids than humans. In addition, because there is a natural increase in corticosteroid production during pregnancy, most women will require a lower exogenous corticosteroid dose and many will not need corticosteroid treatment during pregnancy.

Nursing Mothers: It is not known whether fluticasone propionate is excreted in human breast milk. When initiated fluticasone propionate was administered to rats at a subcutaneous dose of 10 mcg/kg (less than the maximum recommended daily intranasal dose in adults on a mcg/m² basis), radioactivity was excreted in the milk. Because other corticosteroids are excreted in human milk, caution should be exercised when FLONASE Nasal Spray is administered to a nursing woman.

Pediatric Use: Five hundred (500) patients aged 4 to 11 years of age and 440 patients aged 12 to 17 years were studied in US clinical trials with fluticasone propionate nasal spray. The safety and effectiveness of FLONASE Nasal Spray in children below 4 years of age have not been established.

Oral and, to a less clear extent, inhaled and intranasal corticosteroids have been shown to have the potential to cause a reduction in growth velocity in children and adolescents with extended use. If a child or adolescent on any corticosteroid appears to have growth suppression, the possibility that they are particularly sensitive to this effect of corticosteroids should be considered (see PRECAUTIONS).

Geriatric Use: A limited number of patients above 60 years of age (n=275) have been treated with FLONASE Nasal Spray in US and non-US clinical trials. While the number of patients is too small to permit separate analysis of efficacy and safety, the adverse reactions reported in this population were similar to those reported by younger patients.

ADVERSE REACTIONS: In controlled US studies, more than 3300 patients with seasonal allergic, perennial allergic, or perennial nonallergic rhinitis received treatment with intranasal fluticasone propionate. In general, adverse reactions in clinical studies have been primarily associated with irritation of the nasal mucous membranes, and the adverse reactions were reported with approximately the same frequency by patients treated with the vehicle itself. The complaints did not usually interfere with treatment. Less than 2% of patients in clinical trials discontinued because of adverse events; this rate was similar for vehicle placebo and active comparators.

Systemic corticosteroid side effects were not reported during controlled clinical studies up to 6 months' duration with FLONASE Nasal Spray. If recommended doses are exceeded, however, or if individuals are particularly sensitive, or taking FLONASE Nasal Spray in conjunction with administration of other corticosteroids, symptoms of hypercorticism, e.g., Cushing's syndrome, could occur.

The following incidence of common adverse reactions (>3%, where incidence in fluticasone propionate-treated subjects exceeded placebo) is based upon 7 controlled clinical trials in which 536 patients (57 girls and 108 boys aged 4-11 years, 137 female and 234 male adolescents and adults) were treated with FLONASE Nasal Spray 200 mcg once daily over 2 to 4 weeks and 2 controlled clinical trials in which 246 patients (119 female and 127 male adolescents and adults) were treated with FLONASE Nasal Spray 200 mcg once daily over 6 months. Also included in the table are adverse events from 2 studies in which 167 children (45 girls and 122 boys aged 4-11 years) were treated with FLONASE Nasal Spray 100 mcg once daily for 2 to 4 weeks.

Overall Adverse Experiences With >3% Incidence on Fluticasone Propionate in Controlled Clinical Trials With FLONASE Nasal Spray in Patients ≥4 Years With Seasonal or Perennial Allergic Rhinitis

Adverse Experience	Vehicle Placebo (n=758) %	FLONASE 100 mcg Once Daily (n=167) %	FLONASE 200 mcg Once Daily (n=782) %
Headache	14.6	6.6	16.1
Pharyngitis	7.2	6.0	7.8
Epistaxis	5.4	6.0	6.9
Nasal burning/ nasal irritation	2.6	2.4	3.2
Nausea/vomiting	2.0	4.8	2.6
Asthma symptoms	2.9	7.2	3.3
Cough	2.8	3.6	3.8

Other adverse events that occurred in ≤3% but ≥1% of patients and that were more common with fluticasone propionate (with uncertain relationship to treatment) included: blood in nasal mucus, runny nose, abdominal pain, diarrhea, fever, flu-like symptoms, aches and pains, dizziness, bronchitis.

Observed During Clinical Practice: In addition to adverse events reported from clinical trials, the following events have been identified during postapproval use of fluticasone propionate in clinical practice. Because they are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. These events have been chosen for inclusion due to either their seriousness, frequency of reporting, causal connection to fluticasone propionate, occurrence during clinical trials, or a combination of these factors.

General: Hypersensitivity reactions, including angioedema, skin rash, edema of the face and tongue, pruritus, urticaria, bronchospasm, wheezing, dyspnea, and anaphylaxis/anaphylactoid reactions, which in rare instances were severe.

Ear, Nose, and Throat: Alteration or loss of sense of taste and/or smell and, rarely, nasal septal perforation, nasal ulcer, sore throat, throat irritation and dryness, cough, hoarseness, and voice changes.

Eye: Dryness and irritation, conjunctivitis, blurred vision, glaucoma, increased intraocular pressure, and cataracts.

OVERDOSAGE: Chronic overdosage with FLONASE Nasal Spray may result in signs/symptoms of hypercorticism (see PRECAUTIONS). Intranasal administration of 2 mg (10 times the recommended dose) of fluticasone propionate twice daily for 7 days to healthy human volunteers was well tolerated. Single oral doses up to 16 mg have been studied in human volunteers with no acute toxic effects reported. Repeat oral doses up to 80 mg daily for 10 days in volunteers and repeat oral doses up to 10 mg daily for 14 days in patients were well tolerated. Adverse reactions were of mild or moderate severity, and incidences were similar in active and placebo treatment groups. Acute overdosage with this dosage form is unlikely since 1 bottle of FLONASE Nasal Spray contains approximately 8 mg of fluticasone propionate.

The oral and subcutaneous median lethal doses in mice and rats were >1000 mg/kg (>20,000 and >41,000 times, respectively, the maximum recommended daily intranasal dose in adults and >10,000 and >20,000 times, respectively, the maximum recommended daily intranasal dose in children on a mg/m² basis).

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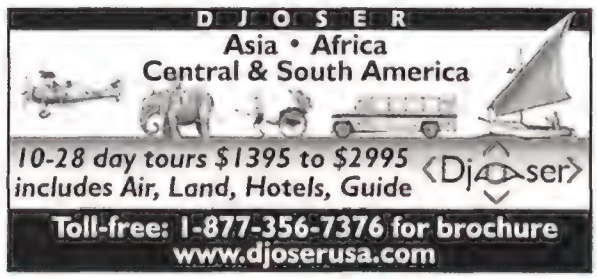
The Silk Road MARKETPLACE



Perfectionist Louis Faurer's charming 1948 photograph of his son, Mark, proved, Mark notes today, "strangely prophetic."

Training Wheels

WHEN 5-YEAR-OLD MARK FAURER SAT behind the wheel of the big Plymouth that day in 1948, he wasn't aware that his father, Louis Faurer, was taking his picture. "It seems strangely prophetic, doesn't it?" Mark says of the photograph. Now 59, he has been driving a taxicab in New York City for 25 years.

INDELIBLE IMAGES

Louis Faurer's moody mid-century photographs are on display in a new exhibition in Andover, Massachusetts, and in a book, *Louis Faurer*, edited by Anne Wilkes Tucker. The photographer found his calling first in his native Philadelphia, then moved to New York City with his wife and their only child after World War II. The light and energy of Times Square held a special appeal. There, he spent nights shooting street scenes, many with lurid movie marquees as background. His subjects tended to be marginalized figures alienated from an indifferent city. "My eyes search for people who are grateful for life," Faurer wrote in 1981, "people who forgive and whose doubts have been removed, who understand the truth, whose enduring spirit is bathed by such piercing white light as to provide their present and future with hope."

Through his then-novel use of reflection, shadow and multiple images, Faurer conveyed a sense of hectic move-

LOUIS FAURER

Driving a taxicab is "hard work," Mark Faurer (above) says today, 54 years after his father photographed him behind the wheel. Louis Faurer (below, c. 1955) never enjoyed the recognition garnered by his close friend and supporter Robert Frank, whose reflection, and his wife Mary's, Faurer captured in an edgy, multi-image 1950 photograph (left) typical of his hallmark city scenes.

ment around stationary characters. His photographs have been compared to film noir, with their intense focus on the mental state of their protagonists. Even the photograph of his son, Mark, an apparently delighted subject, embodies Faurer's evocative lighting, his ominous, overpowering empty spaces, and a vulnerable central figure.

To support his family, Louis Faurer moved into fashion photography, shooting in the 1950s and '60s for *Harper's Bazaar, Vogue, Mademoiselle* and *Seventeen*. "He took pride in his fashion work," says Mark Faurer. "He was a perfectionist. He was always trying to get graceful lines and intelligent expressions from his models."

But it was Faurer's street pictures that ensure his legacy. The critic Paul Richard has written that Faurer's work occupies "that place between two of the most influential 'straight' photographers of our century, the political Walker Evans and the more emotional Robert Frank." Faurer and Frank, best known for his masterwork *The Americans,* were friends; they shared darkroom space and inspired each other. Decades later, a foundation established by Frank donated $100,000 to mount the Faurer show and produce Tucker's book.

Faurer never achieved great fame, and returning to the United States in 1974 after six years in Europe, he was dogged by money troubles. He taught part-time and lectured, and an exhibition of his work was mounted in 1981. In 1984, he was struck by a car and suffered a debilitating head injury; he died last year at age 84.

The retrospective of Louis Faurer's work—organized by Houston's Museum of Fine Arts, which also published the book—is at the Addison Gallery of American Art in Andover, Massachusetts, until July 28. It then moves to the Museum of Photographic Arts in San Diego (August 11 to October 20), the Art Institute of Chicago (November 9 to January 26, 2003) and the Philadelphia Museum of Art (June 14 to September 7).

Though Faurer taught his son to use a camera and work in the darkroom, Mark enlisted in the Marines and moved to California, working at a variety of jobs before returning to New York in 1977. He and his wife of 30 years, Margaret, have two daughters. "My dad wanted me to continue studying piano," Mark recalls. "He said I was an artist. He thought driving a taxi was bad for my health."

Today, when Mark looks at the picture of himself in the Plymouth, he ponders his youthful joy. "That's not how I feel when I'm in my car today," he says. Now and then, though, a passenger who knows Louis Faurer's work climbs into his taxi. "They tell me he was a great photographer, and that makes me feel pretty good."

Elizabeth Royte is author of The Tapir's Morning Bath: Solving the Mysteries of the Tropical Rain Forest.

SYLVIA PLACHY; LOUIS FAURER; MARK FAURER COLLECTION

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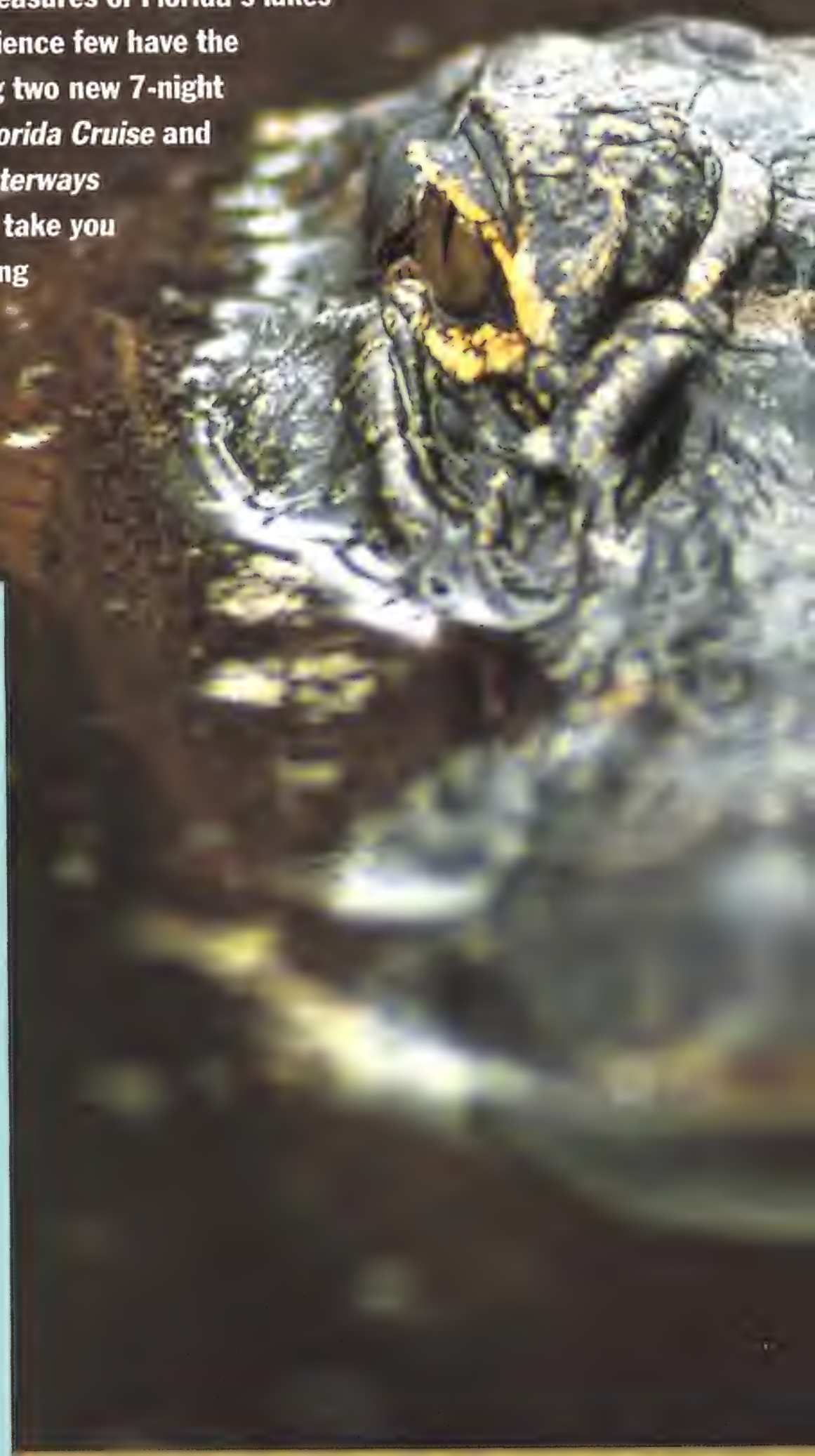

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PRESENCE OF MIND

Kon Artist?

THOUGH EVIDENCE AGAINST HIS THEORY GREW, KON-TIKI SAILOR THOR HEYERDAHL NEVER STEERED FROM HIS COURSE

BY RICHARD CONNIFF

Heyerdahl (inset) maintained throughout his life that the 1947 *Kon-Tiki* voyage proved that Polynesia was settled by way of South America.

ONE OF THE FIRST LESSONS YOU learn going into the field as an anthropologist, archaeologist or journalist is never to come back empty-handed. The cost of the expedition, the need to gratify sponsors, the urge to make a name, all turn up the pressure to get the story. So it's easy to forget the second great lesson of fieldwork: beware of a story that's just a little too good.

Thor Heyerdahl, who died in April at the age of 87, spent much of an active and sometimes inspiring life in the thrall of one good story. He believed that, long before Columbus, early ocean travelers—tall, fair-skinned, redheaded Vikings much like himself—spread human culture to the most remote corners of the earth. Academics scoffed, particularly at his idea that the islands of the mid-Pacific had been colonized by way of South America, rather than by Polynesians from the western Pacific. In 1947, Heyerdahl risked his life attempting to prove his point. He built a balsa-log raft, the *Kon-Tiki*, and in one of the great ocean adventures of the 20th century, he and his small crew made the harrowing 4,300-mile voyage from Peru to French Polynesia.

In the process, Heyerdahl established himself as an almost mythic hero. His best-selling book *Kon-Tiki* inspired a new generation of scholars—many of whom went on to systematically refute their hero's great idea.

The trouble with a good story is that it has a way of distorting the facts: we see what we want to see and close our eyes to everything else. In the 1970s, scholars and filmmakers were so enraptured with the idea of peace-loving, Stone Age hunter-gatherers they failed to notice that the gentle Tasaday were a very modern Filipino hoax. In the harsher zeitgeist of more recent times, a hotly disputed book, *Darkness in El Dorado*, charges that anthropologist Napoleon Chagnon believed so firmly in the savagery of Venezuela's Yanomami that he instigated the very bloodshed he went there to document. (Chagnon steadfastly denies the charge.)

A good story can be so compelling that teller and subject become entrapped together in its charms, and this was never more true than when Heyerdahl came swashbuckling onto Easter Island in 1955, determined to find hard evidence of South American origins.

He liked to be known to the islanders as Señor Kon-Tiki, and asked, among other things, for samples of old pottery, a technology known in South America but not in Polynesia. One enterprising islander promptly broke up a pot and buried the shards, a ruse Heyerdahl readily detected. "If there is a moral to all this," another member of the expedition wrote later, "it is that archaeologists should be cautious about telling local, nonprofessionals what they would like to find." Incautiously, Heyerdahl displayed a stuffed caiman from South America and the llama-like camel on a pack of cigarettes,

AGENCE FRANCE-PRESSE (2)

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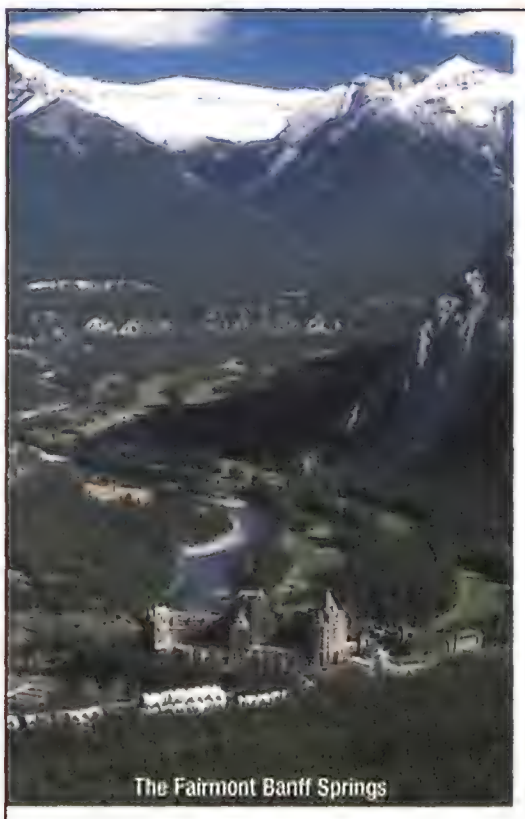

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exhibit opening on October 12. Voyage into Myth: Gauguin to Matisse draws from the famous Hermitage Museum collection in St. Petersburg. Seventy-five masterpieces by Cézanne, Gauguin, Matisse, Picasso and others will be shown, some for the first time in North America – including Maurice Denis' epic series of 13 wall panels for The Story of Psyche, displayed in a recreation of their original setting.

Niagara-on-the-Lake, minutes from one of the world's great natural wonders, is also home to one of North America's finest cultural attractions – **The Shaw Festival**. The Shaw is the world's only theatre specializing in works written or set in George Bernard Shaw's lifetime, and its eclectic array of comedies, dramas and classics have captivated audiences since 1962. Niagara-on-the-Lake welcomes visitors to award-winning wineries, heritage sites and an architectural treasure trove of Regency, Victorian and Edwardian homes. Visitors can choose to stay in quaint country inns, de luxe modern hotels, or one of the town's many private bed-and-breakfasts.

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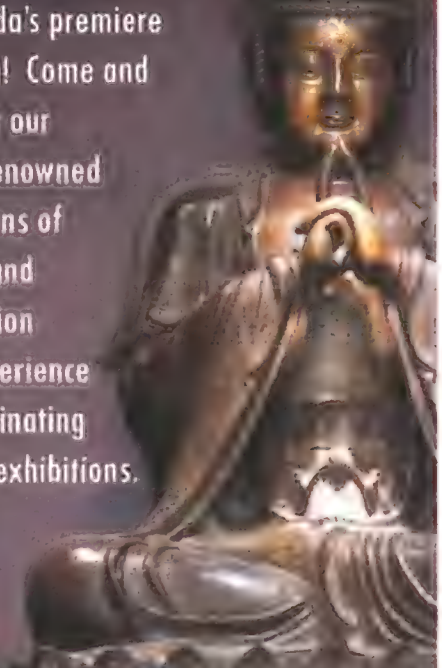

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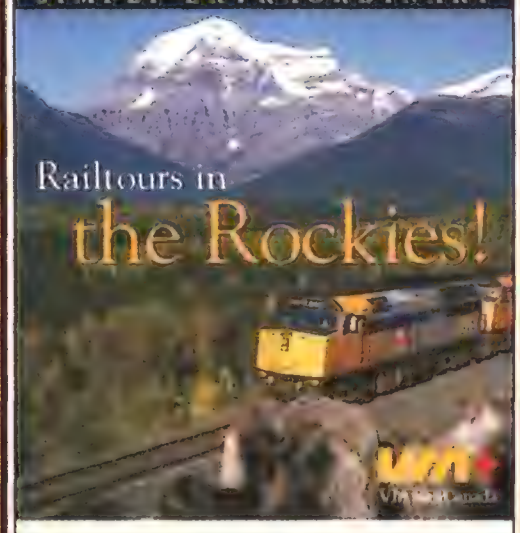

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to elicit the kinds of artifacts he sought.

His 1958 book, *Aku-Aku*, described just how brilliantly he succeeded. After discovering that the islanders had secret family caves full of "ancient" stone sculptures, Heyerdahl gained admission to them by invoking his own considerable spiritual aura, or *aku-aku*. By giving the islanders clothing, food and cigarettes, he persuaded them to hand over almost a thousand carvings, some of them redolent of South America: a penguin, llamas, a reed boat like the ones used on Lake Titicaca in Peru.

When I visited the islanders in 1992, they still clearly admired Señor Kon-Tiki, and they celebrated him as "good p.r. for Easter Island." But they delighted in pointing out how selective and misleading he had been in the evidence he marshaled for his hypothesis.

One day I was talking with an island businessman in gold-rimmed glasses and a blue button-down shirt. "Thor knew I was a very good carver, and he came to see me," he said. "He asked me to take out of my cave all the ancient objects that I had there, to sell to him. I told him I didn't have anything, and he said, 'I know exactly what you have. At the entrance to your cave, there is the head of a whale. . . ' And he started mentioning things that he insisted I had. I said I didn't have them, and he said, 'No, no, no! You have them and I'll pay you for them.' So I understood perfectly well that he was saying, 'Carve them and I'll pay you.'"

He thought about this for a moment, then added: "He was fooling the world. He was making his own spectacle. . . . He was writing the book to make people say, 'Ah!' And it was good for the island in a certain way, because tourists came."

The first time I heard this, I didn't believe it: the islanders have a rich tradition of making up their own history, and they naturally wanted to seem like the shrewd ones in this relationship. But the implication that *Aku-Aku* was riddled with genial deceptions by Heyerdahl and the islanders, on one another and the world, came up over and over, with only minor variation.

In the island tradition, Pedro Pate believed in giving Heyerdahl what he wanted.

One of the most interesting accounts came from a man whose secret cave was the source of 47 of the celebrated stone figures. In his 1975 book, *The Art of Easter Island*, Heyerdahl described at length how he determined their authenticity, concluding, "It was obvious to all of us that Pedro Pate could not have staged this cave. . . . " Pate, now deceased, was a 73-year-old fisherman and carver at the time of my visit, and he laughed at the idea of authenticity. When he'd first brought a sack of carvings to Heyerdahl's camp, he said Heyerdahl refused to look at them. The venue was wrong. "He said, 'No, no, no, you take these things to the caves,'" where Heyerdahl could discover them.

At Pate's cave, Heyerdahl wrote, he was particularly impressed with a carving of a two-masted reed boat, on which the dust lay a half-inch thick. He carried it out of the cave himself. To demonstrate that no modern islander could have produced such a masterpiece, Heyerdahl reported that one of the best carvers on the island had tried to create a replica; the result, he wrote, was clumsy and unconvincing.

I showed Pate a two-page photograph of the reed boat from Heyerdahl's book, and he grinned. He'd carved the boat himself, he said. Dubious, I offered him $100 to carve such a boat now, 37 years later, and he accepted. When I visited him again, he was working in front of his house, with the half-formed sculpture propped up on a block of wood and his chisels, rasps and an adze laid out beneath him on a piece of corrugated cardboard.

A few days later, he presented me with the 18-inch-long reed boat he had carved. It was as good as the one in the book. I paid him, and as he wrapped the boat for me to take, he told me confidentially, like a shopkeeper suggesting a second pair of pants to go with a new suit, that he had actually carved two.

When I got the news, ten years later, that Heyerdahl had died, I retrieved that old carving from my yard. It's broken into pieces now, and clotted with leaf litter and mud. I phoned an Easter Island archaeologist, William Ayres, who chairs the Pacific Island Studies program at the University of Oregon, and he confirmed that many of Heyerdahl's cave carvings are now deemed modern. I leafed through my old notes from an interview with an islander who used to kid Heyerdahl in later years about the faked carvings. But Heyerdahl stuck by his story to the end. Once, at a conference, a colleague asked him how he could persist with the South American hypothesis when his own archaeologists had produced overwhelming evidence that the Easter Island culture had, in fact, come from Polynesia. Heyerdahl looked down at him like a giant crane peering down on a small worm, and he said, "Well, I have *my* audience."

An audience is what everyone who works in the field ultimately wants: a chance to climb up out of the dust and make the world say, "Ah!" But at what cost? Turning over Pedro Pate's sculpture and studying it under the light at my desk, it seemed to me that what I held in my hand was that titillating and very dangerous thing: a good story.

As a child, author Richard Conniff regarded Thor Heyerdahl as a hero.

JAMES L. AMOS

Chilly Reception

DR. JOHN GORRIE FOUND THE COMPETITION ALL FIRED UP WHEN HE TRIED TO MARKET HIS ICE-MAKING MACHINE

BY MINNA SCHERLINDER MORSE

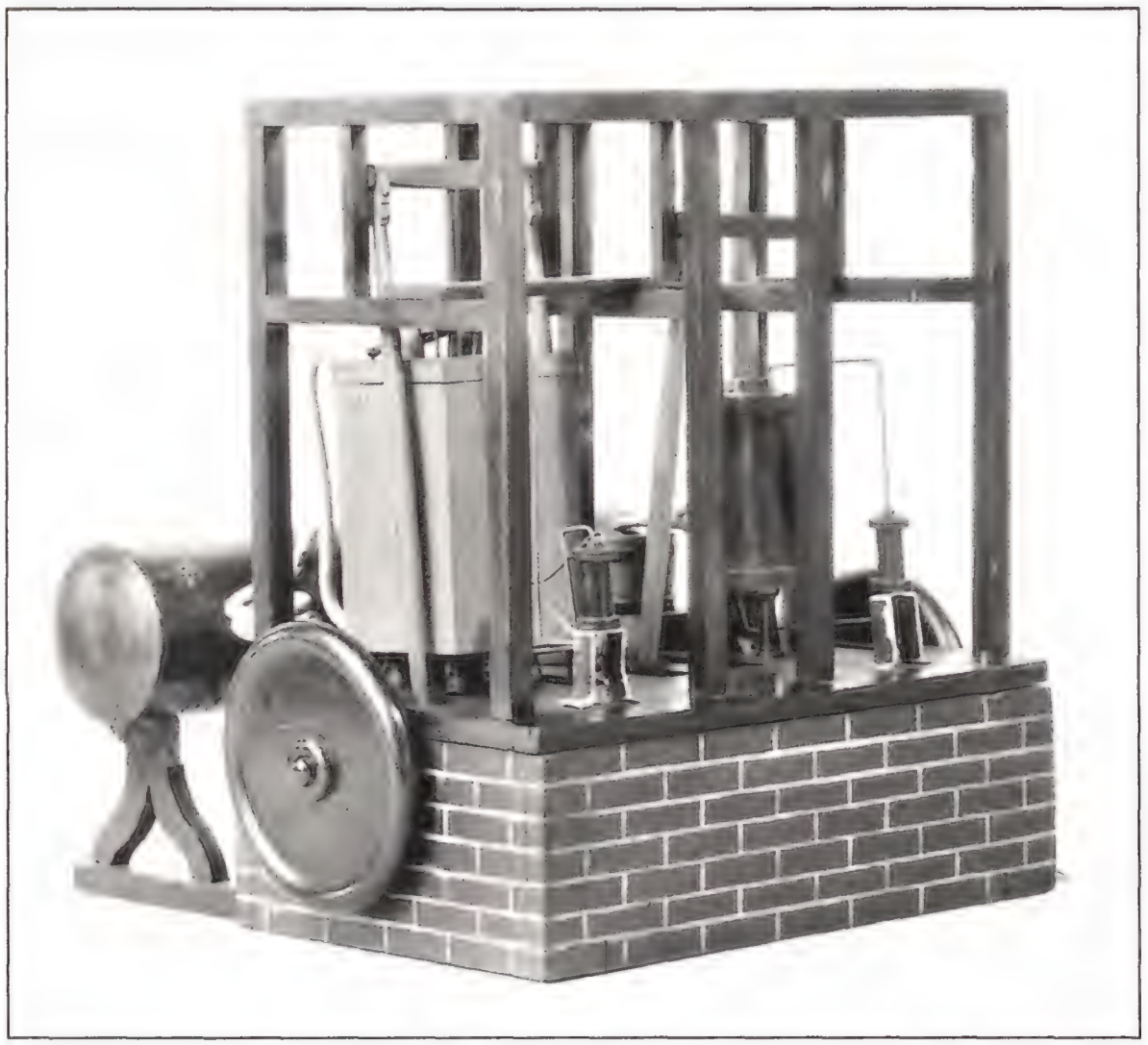
IT WAS JULY 14, 1847, IN THE MUGgy port town of Apalachicola, Florida, and the stores of ice from the North had run out. The French consul Monsieur Rosan was celebrating Bastille Day, the story goes, and his guests were fearing a dreadfully uncomfortable afternoon. As if on cue, a local doctor complained theatrically about the necessity of drinking warm wine. Monsieur Rosan rose. "On Bastille Day," he announced, "France gave her citizens what they wanted; Rosan gives his guests what they want, cool wines! Even if it demands a miracle!" Suddenly, waiters appeared carrying large silver trays piled with bottles of champagne nestled in ice. But where had it come from? Had a shipment come through from the North? *Mais non*. The ice had been created right there in Florida.

"Let us drink to the man who made the ice," one of the guests declared. "Dr. Gorrie."

Local physician John Gorrie had spent more than five years tinkering with a mechanical refrigeration machine, a contraption that could both make ice and cool air. For years, he had used it in his infirmary, to make his fever patients more comfortable.

Within a few years of Rosan's soiree, Dr. Gorrie's artificial ice machine would be patented in London and the United States, and the doctor would largely forgo his practice, devoting himself to promoting his device.

In a corner of the National Museum of American History, now closed off for the creation of a new exhibit, there stood for many years a case labeled "Mechanical Refrigeration." It held the patent model of Gorrie's invention—the first machine of its kind—along with the U.S. patent and a portrait of the earnest-looking Gorrie.



John Gorrie's steam-engine-driven ice-making machine, patented in 1851, used the compression and expansion of air to create refrigeration.

Just across the exhibit space was another display, labeled "Ice," and within it, another portrait. This one was of the so-called Ice King, a man named Frederic Tudor, whom Gorrie blamed for making the last years of his life very uncomfortable indeed.

In a world in which air-conditioning has made possible the mass movement of whole populations to warmer climates, it is hard to imagine a time when man-made cold was considered an impossible dream. But in the mid-1800s, even having natural ice delivered to tropical climes was a relatively recent development. For millennia, people in the earth's warmer regions had needed to drink milk when it was drawn from the cow, eat fruits and vegetables just as they ripened, and (*mon Dieu!*) endure warm wine.

In 1805, two years after Gorrie's birth, a young Boston businessman had taken as a challenge an offhanded

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question his brother had asked at a party. Why can't the ice of New England's ponds be harvested, transported to and sold at ports in the Caribbean?

Within the year, Frederic Tudor arranged for his first shipment of ice to Martinique, an enterprise that might have been deemed a success had a goodly amount of the cargo not melted soon after its arrival. Tudor spent the next few years experimenting with various kinds of insulation before settling on sawdust. He constructed icehouses throughout the tropics and created a demand there for cold refreshments. In the 1820s he joined forces with a young inventor who developed the plowlike sawing machines that scored and cut New England's frozen ponds into symmetrical blocks. By 1846, Tudor was shipping tens of thousands of tons of ice from Boston to destinations all over the globe. His monopoly remained unchallenged for decades. "The coast is now cleared of interlopers," the Ice King once declared. "If there are any unslain enemies, let them come out."

Ridiculed as a crank, Gorrie died before his ice-making invention would be recognized. Boston merchant Frederic Tudor (right) built a vast empire of ships and icehouses that supplied ice to many cities around the world.

In 1833, the same year that Tudor made news by shipping 180 tons of ice from New England to Calcutta, Dr. John Gorrie arrived in the sweltering town of Apalachicola, a burgeoning cotton port on the west coast of Florida.

Gorrie set up a medical practice and took on the positions of postmaster and notary public to supplement his income. After three years of civic involvement, he was elected the town's mayor. But when yellow fever hit the area in 1841, Gorrie dedicated the bulk of his time to his practice—and to finding a treatment for his many patients.

Although he did not know that yellow fever was spread by mosquitoes, he had observed that outbreaks of the disease seemed to be influenced by heat—"Nature would terminate the fevers by changing the seasons," he noted. He devised a method of cooling his infirmary. He would suspend a pan of ice from the ceiling and make an opening through it so air could escape through the chimney.

In the large home where he'd lived first as boarder, then as husband to the proprietress, Gorrie had already begun transforming room after room for his practice and his experiments (much to the chagrin of his wife). But he still faced one problem. The cooling mechanism required ice, and supplies were limited. Somehow, he would need to make it himself.

Working obsessively, he followed the same basic principles that had driven previous refrigeration attempts—most notably, William Cullen's 1755 creation of ice by evaporating ether in a vacuum.

When a liquid evaporates into a gas, it does so at a particular temperature, which varies depending on the amount of pressure it is under. As it evaporates, the liquid extracts heat from the surroundings, cooling them. Likewise, when a gas is compressed, it is heated; when the pressure is removed, and the gas expands, it absorbs heat, cooling its surroundings.

Gorrie, who used air as the working gas in his machine, took his idea north to the Cincinnati Iron Works, which created a model for public demonstration. But the notion that humans could create ice bordered on blasphemy. In the *New York Globe*, one writer complained of a "crank" down in Florida "that thinks he can make ice by his machine as good as God Almighty."

Having found both funding—from a Boston investor who remains unknown—and a manufacturing company willing to produce the contraption, Gorrie became the first person to create a commercially available refrigeration machine. But he quickly fell on hard times.

In 1851, the year Gorrie received a U.S. patent on his ice machine, his chief financial backer died. With his invention being ridiculed regularly in the press, his other investors fell by the wayside. Gorrie suspected that Frederic Tudor had spearheaded a smear campaign against him and his invention. It was to Tudor that the doctor was presumably referring, says biographer Vivian M. Sherlock, when he wrote that "moral causes . . . have been brought into play to prevent [the machine's] use."

Without funds, Gorrie retreated to Apalachicola, where he awaited word on a patent for his other innovation, the air-conditioning process. It never came. Reflecting on his troubles, he concluded that mechanical refrigeration "had been found in advance of the wants of the country." Suffering from a nervous collapse and devastated by failure, he died in 1855 at age 51.

Minna Scherlinder Morse is a writer living in Washington, D.C.

NATIONAL MUSEUM OF AMERICAN HISTORY, SI (2)

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GHOST RIDERS—Each July since 1980, as many as 100 horsemen ride 62 1/2 miles across California's San Joaquin Valley, from Madera to Three Rocks, with a stop at Cantua Creek. Here, the legendary Mexican-American folk hero Joaquin Murieta was most likely killed by state rangers July 25, 1853. (Nobody knows for sure about those lawless days.) Jeffrey Brown is a freelance photographer in San Diego.

PHENOMENA

& CURIOSITIES

Peewee Power

THE INVENTION OF A GAS-FUELED GENERATOR THE SIZE OF A QUARTER HERALDS A FUTURE OF EVER-SMALLER MACHINES

BY FRED HAPGOOD

THE LIGHTBULB WENT ON WHEN Alan Epstein, a meticulous 53-year-old engineer with a twinkling sense of humor, was sitting in a jury pool in a Cambridge, Massachusetts, courthouse. The question he was pondering that spring day in 1994 had been put to him by a United States Air Force official: How difficult would it be to build a jet engine the size of, say, a coffee cup? Epstein, the head of MIT's Gas Turbine Laboratory, which has a staff of 80 and receives $8 million in research funds annually, had answered: *difficult*.

But as he awaited his jury assignment, he reconsidered the question. What if a tiny turbine could be built using the approach perfected by computer-chip makers? That is, construct it not out of thousands of steel, aluminum and copper parts welded and riveted together, but etch it instead on a wafer of silicon. A turbine made that way, he thought to himself, could even be as small as a shirt-collar button.

To understand how Epstein's colleagues at first reacted to his notion, keep in mind that although turbine engineering has many satisfactions, the mischievous pursuit of startling innovations is not usually one of them. Advances in the field tend to be incremental in the extreme. Because turbine failure can be so catastrophic—the engines propel jet aircraft, after all, and are used by electric utilities to generate power—caution is the rule in the esoteric world of turbine R&D.

The way Epstein remembers it, every time he presented the idea of a microturbine etched out of silicon to his colleagues, they laughed in his face. But nobody's laughing now: Epstein and

"The future is small," says MIT's Epstein (in his lab, above, holding a demonstration gas turbine), who has spent seven years trying to turn his jury-duty brainstorm into a reality.

his coworkers have won over doubters with a prototype turbine the size of a quarter that, though crude in some respects, will eventually generate enough power to run a cell phone. That may not sound like much to show for seven years of high-intensity research, but turbine experts say it's a huge accomplishment. Commercial and military applications for such a power source abound. Ounce for ounce, a minuscule turbine generator fueled by kerosene could produce 10 to 20 times the power of a conventional battery. A computer laptop might run continuously for a week on one cartridge; a cell phone cartridge might fuel 72 hours of conversation. Ultimately, though, Epstein speculates, the virtue of microturbine-powered consumer electronics won't be how much longer they operate but how much smaller and lighter the components might be.

A chief supporter of the microturbine generator project is the U.S. Army, which wants portable, lightweight power sources to run an arsenal of electronic devices such as radios, computers and satellite-based navigation equipment. "As soldiers get more electronic and they're farther from outlets, power sources become more important," Epstein says.

In Epstein's view, machines are in the midst of a design revolution akin to what electronics went through decades ago, when transistors and computer chips spurred development of smaller and smaller products. "The idea of making micro devices is spreading very rapidly throughout every discipline of science and engineering," he says. And his team's contribution to the emerging field of what is known as microelectromechanical systems, or MEMs, is the microgenerator that his lab has produced. "I think we invented a new field," Epstein says. "Power MEMs."

It was no small feat squeezing the concept of the huge roaring turbine engine that we're all familiar with into a quietly whirring device the size of a coin. "There were many times that our brains were fried," says Stuart Jacobson, who worked for the project and is now in private industry. "But you would be hard-pressed to find anyone that would tell you that it wasn't one of the best experiences they ever had." The research has "changed the way we think about turbines," Epstein says. For instance, it demolished information long presented

Parts of silicon micro-engines include a rotor, bottom left, and turbine, bottom right.

ALL: JASON GROW

in textbooks that a turbine combustion chamber, because of a presumably unyielding engineering limit, had to be 18 inches long. The new research proved the received wisdom wrong, showing that the combustion chamber "could actually be scaled down," he says.

Conventional gas turbines use the explosive power of combusted fuel to spin fanlike blades at high speeds; the blades can create thrust, as in a jet engine, or electric current, if attached to a generator. One obstacle to shrinking a turbine is what might be called fan physics. For a gas turbine to work well, the tips of its rotors have to turn at near the speed of sound. But the smaller the turbine, the faster the rotor must spin for its tips to achieve near-sonic speed. Thus, while a conventional jet engine's rotor spins efficiently at about 20,000 revolutions per minute, the MIT microturbine rotor has to turn more than 100 times faster, or two million rpm—more than 20,000 revolutions per *second*.

Epstein and his colleagues figured that a shaft turning at such an extraordinary speed would quickly wear out. So the 50-member team came up with a way for the rotor to use its blistering speed to levitate, hovering precisely in place like a miniature, supercharged Frisbee. Instead of ball bearings, it has "air bearings," Epstein says.

Frank Marble, retired Cal Tech professor and eminence of turbine engineering, thinks Epstein's tiny engines have a bright, if yet unknown, future. Like the jet engine, whose use on civilian aircraft was a revolutionary afterthought, "we probably will use these microturbines the most in areas we conceive of the least," says Marble.

Epstein is the first to caution that the technology still isn't ready for prime time. The microturbine generates a lot of heat, and he has yet to implement a solution for cooling the mechanism or its exhaust. After all, no one's going to put a scorching hot cell phone to her ear. For now, Epstein says, "we have the world's first jet-powered hair dryer." That's no mere joke. He has actually been approached by a company interested in producing a hair dryer that isn't plugged in (always an electrocution hazard). As it is, Epstein's group has a contract with the Army that calls for the scientists to demonstrate a microturbine generator within four years. That deadline, he says, is no problem.

The development of the microturbine, which has borrowed heavily from the information revolution's knack for chip making and for scaling big ideas down to size, augurs a sci-fi future of incredible shrinking machines, from artificial organs to pipsqueak robots, according to the experts. "The future is small," Epstein says. In other words, micromachines could well be the Next Big Thing.

Fred Hapgood is a freelance writer in Boston.

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On the Street

In 1945, Italian director Roberto Rossellini took to the streets of war-ravaged Rome to create his own starkly realistic story of that city's devastation. The resulting film, *Rome, Open City*, was shot in a raw, new documentary style, full of gritty detail. The movie launched the movement known as neorealism and forever altered the way urban life was pictured in photography as well as film.

A new exhibition of the work of 19 international artists who have turned their lenses on the urban theater over the past half century takes its title from Rossellini's film. On view through September 8 at the Smithsonian's Hirshhorn Museum and Sculpture Garden, "Open City: Street Photographs since 1950" charts the evolution of street photography from the spontaneous and edgy postwar black-and-white images of Swiss-born artist Robert Frank to the staged, large-scale color work of Canadian Jeff Wall.

"There was a sense of spontaneity and voyeurism—an aggressive, in-your-face quality—that developed in photography in the early 1950s," says the Hirshhorn's Kerry Brougher, who cocurated the show. Using new, faster films and smaller, portable cameras, photographers like Frank were able to shoot up close and on the run, using available light. Rejecting classical composition, they opted instead for speed and informality, an approach that continues to influence the work of subsequent generations drawn to the theater of the street. —*Diane M. Bolz*

In the mid-1950s, Robert Frank produced an unsparing portrait of American life in a series of images (here, *Rodeo—New York City*) that conveyed a sense of immediacy and alienation.

MUSEUM OF CONTEMPORARY ART, LOS ANGELES;
RALPH M. PARSONS FOUNDATION PHOTOGRAPHY COLLECTION

Along the Silk Road

For a few years now, Japanese-born photographer Kenro Izu has been traveling the central Asian trade routes that merchants and monks plied for centuries. His stunning images (including Tibet's Mount Kailash, right) are showcased in "Sacred Sites: Silk Road Photographs," an exhibition at the Sackler Gallery through January 5, 2003.

Handed Down to History

This is the story of an ordinary object. A window washer's tool. A squeegee, to be exact. Shaped like a fat letter T. Palm-size and solid brass. Once it was nothing more, or less, than a device by which a man earned his livelihood; now it is a life saver. Marked with traces of plaster dust—the tragic taint of September 11—this humble relic passed from the grip of window washer Jan Demczur into the collection of the Smithsonian's National Museum of American History this past April. With the handle came Demczur's dust-covered blue uniform, rubber-soled work shoes, the leather squeegee holder from his belt. And with all these items came the story, told by a gentle, soft-spoken hero, of six men in the wrong place at the wrong time—with the right tool.

The men were ascending the heights of One World Trade Center in an express elevator shortly before 9 A.M. Their normal day ended with a sudden jolt and the split-second awareness that their car was

plunging. There was yelling. And cursing. Someone scrambled to find the emergency stop button. The elevator screeched to a halt. The men smelled smoke. After a brief and frantic exchange, the intercom went dead. Doors were pried open only to reveal a wall and a floor number—50. One of the passengers had a carton of milk, and soon all six were breathing through milk-dampened handkerchiefs. An emergency light provided dim illumination.

Demczur stood by the doors that had been propped open with a long squeegee handle. "I turned, my hand just brushed the [exposed] wall. Ohh! Sheetrock! I was happy," he says, recalling from a long-ago stint as a construction worker that Sheetrock is relatively easy to kick or punch through. But a few hard kicks accomplished nothing, and a puzzled Demczur called out for something sharp—anything—a pocketknife. No luck. The sharpest tool available was his squeegee's blade, and with that he set to work, scoring, scratching, scraping at the Sheetrock, determined to find out why they couldn't kick through.

Window washer Jan Demczur, wearing white gloves to protect his plaster-dust-covered squeegee handle, donates the tool to the nation.

Then he realized the wall consisted of three three-quarter-inch-thick layers of Sheetrock. "Wow! Three pieces. It was going to be hard to break through it."

In rotation with three or four of the other men, Demczur persevered. "We just started working. Focused on this way to get out. We knew we had only one chance."

And then, that one chance—that blade—slipped out of Demczur's hands, falling right down the elevator shaft. "I was very upset with myself. We had a problem and now a bigger problem." A man standing next to Demczur reached into the window washer's bucket and seized the squeegee handle. One more chance.

They returned to the wall, systematically cutting furrows, both vertical and horizontal, creating at last a sizable depression in the first two layers of Sheetrock—some 18 by 20 inches in size. "We didn't know what was going on [in the building], but we knew time was running out," Demczur said. They kicked and kicked again,

KENRO IZU/FREER GALLERY OF ART, SI; JEFF TINSLEY/SI; RICHARD STRAUSS/SI

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Brief Summary—see package insert for full prescribing information. **INDICATIONS AND USAGE** ARICEPT® is indicated for the treatment of mild to moderate dementia of the Alzheimer's type. **CONTRAINDICATIONS** ARICEPT® is contraindicated in patients with known hypersensitivity to donepezil hydrochloride or to piperidine derivatives. **WARNINGS** ***Anesthesia:*** ARICEPT®, as a cholinesterase inhibitor, is likely to exaggerate succinylcholine-type muscle relaxation during anesthesia. ***Cardiovascular Conditions:*** Because of their pharmacological action, cholinesterase inhibitors may have vagotonic effects on the sinoatrial and atrioventricular nodes. This effect may manifest as bradycardia or heart block in patients both with and without known underlying cardiac conduction abnormalities. Syncopal episodes have been reported in association with the use of ARICEPT®. ***Gastrointestinal Conditions:*** Through their primary action, cholinesterase inhibitors may be expected to increase gastric acid secretion due to increased cholinergic activity. Therefore, patients should be monitored closely for symptoms of active or occult gastrointestinal bleeding, especially those at increased risk for developing ulcers, e.g., those with a history of ulcer disease or those receiving concurrent nonsteroidal anti-inflammatory drugs (NSAIDS). Clinical studies of ARICEPT® have shown no increase, relative to placebo, in the incidence of either peptic ulcer disease or gastrointestinal bleeding. ARICEPT®, as a predictable consequence of its pharmacological properties, has been shown to produce diarrhea, nausea and vomiting. These effects, when they occur, appear more frequently with the 10 mg/day dose than with the 5 mg/day dose. In most cases, these effects have been mild and transient, sometimes lasting one to three weeks, and have resolved during continued use of ARICEPT®. ***Genitourinary:*** Although not observed in clinical trials of ARICEPT®, cholinomimetics may cause bladder outflow obstruction. ***Neurological Conditions:*** Seizures: Cholinomimetics are believed to have some potential to cause generalized convulsions. However, seizure activity also may be a manifestation of Alzheimer's Disease. ***Pulmonary Conditions:*** Because of their cholinomimetic actions, cholinesterase inhibitors should be prescribed with care to patients with a history of asthma or obstructive pulmonary disease. **PRECAUTIONS Drug-Drug Interactions** ***Drugs Highly Bound to Plasma Proteins:*** Drug displacement studies have been performed *in vitro* between this highly bound drug (96%) and other drugs such as furosemide, digoxin, and warfarin. ARICEPT® at concentrations of 0.3-10 µg/mL did not affect the binding of furosemide (5 µg/mL), digoxin (2 ng/mL), and warfarin (3 µg/mL) to human albumin. Similarly, the binding of ARICEPT® to human albumin was not affected by furosemide, digoxin, and warfarin. ***Effect of ARICEPT® on the Metabolism of Other Drugs:*** No *in vivo* clinical trials have investigated the effect of ARICEPT® on the clearance of drugs metabolized by CYP 3A4 (e.g. cisapride, terfenadine) or by CYP 2D6 (e.g. imipramine). However, *in vitro* studies show a low rate of binding to these enzymes (mean K_i about 50-130 µM), that, given the therapeutic plasma concentrations of donepezil (164 nM), indicates little likelihood of interference. Whether ARICEPT® has any potential for enzyme induction is not known. ***Effect of Other Drugs on the Metabolism of ARICEPT®:*** Ketoconazole and quinidine, inhibitors of CYP450, 3A4 and 2D6, respectively, inhibit donepezil metabolism *in vitro*. Whether there is a clinical effect of these inhibitors is not known. Inducers of CYP 2D6 and CYP 3A4 (e.g., phenytoin, carbamazepine, dexamethasone, rifampin, and phenobarbital) could increase the rate of elimination of ARICEPT®. ***Use with Anticholinergics:*** Because of their mechanism of action, cholinesterase inhibitors have the potential to interfere with the activity of anticholinergic medications. ***Use with Cholinomimetics and Other Cholinesterase Inhibitors:*** A synergistic effect may be expected when cholinesterase inhibitors are given concurrently with succinylcholine, similar neuromuscular blocking agents or cholinergic agonists such as bethanechol. **Carcinogenesis, Mutagenesis, Impairment of Fertility** Carcinogenicity studies of donepezil have not been completed. Donepezil was not mutagenic in the Ames reverse mutation assay in bacteria. In the chromosome aberration test in cultures of Chinese hamster lung (CHL) cells, some clastogenic effects were observed. Donepezil was not clastogenic in the *in vivo* mouse micronucleus test. Donepezil had no effect on fertility in rats at doses up to 10 mg/kg/day (approximately 8 times the maximum recommended human dose on a mg/m² basis). **Pregnancy** ***Pregnancy Category C:*** Teratology studies conducted in pregnant rats at doses up to 16 mg/kg/day (approximately 13 times the maximum recommended human dose on a mg/m² basis) and in pregnant rabbits at doses up to 10 mg/kg/day (approximately 16 times the maximum recommended human dose on a mg/m² basis) did not disclose any evidence for a teratogenic potential of donepezil. However, in a study in which pregnant rats were given up to 10 mg/kg/day (approximately 8 times the maximum recommended human dose on a mg/m² basis) from day 17 of gestation through day 20 postpartum, there was a slight increase in still births and a slight decrease in pup survival through day 4 postpartum at this dose; the next lower dose tested was 3 mg/kg/day. There are no adequate or well-controlled studies in pregnant women. ARICEPT® should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. **Nursing Mothers** It is not known whether donepezil is excreted in human breast milk. ARICEPT® has no indication for use in nursing mothers. **Pediatric Use** There are no adequate and well-controlled trials to document the safety and efficacy of ARICEPT® in any illness occurring in children. **ADVERSE REACTIONS Adverse Events Leading to Discontinuation** The rates of discontinuation from controlled clinical trials of ARICEPT® due to adverse events for the ARICEPT® 5 mg/day treatment groups were comparable to those of placebo-treatment groups at approximately 5%. The rate of discontinuation of patients who received 7-day escalations from 5 mg/day to 10 mg/day, was higher at 13%. The most common adverse events leading to discontinuation, defined as those occurring in at least 2% of patients and at twice the incidence seen in placebo patients, are shown in Table 1.

Table 1. Most Frequent Adverse Events Leading to Withdrawal from Controlled Clinical Trials by Dose Group

Dose Group	Placebo	5 mg/day ARICEPT®	10 mg/day ARICEPT®
Patients Randomized	355	350	315
Event/%Discontinuing			
Nausea	1%	1%	3%
Diarrhea	0%	<1%	3%
Vomiting	<1%	<1%	2%

Most Frequent Adverse Clinical Events Seen in Association with the Use of ARICEPT® The most common adverse events, defined as those occurring at a frequency of at least 5% in patients receiving 10 mg/day and twice the placebo rate, are largely predicted by ARICEPT®'s cholinomimetic effects. These include nausea, diarrhea, insomnia, vomiting, muscle cramp, fatigue and anorexia. These adverse events were often of mild intensity and transient, resolving during continued ARICEPT® treatment without the need for dose modification. There is evidence to suggest that the frequency of these common adverse events may be affected by the rate of titration. An open-label study was conducted with 269 patients who received placebo in the 15- and 30-week studies. These patients were titrated to a dose of 10 mg/day over a 6-week period. The rates of common adverse events were lower than those seen in patients titrated to 10 mg/day over one week in the controlled clinical trials and were comparable to those seen in patients on 5 mg/day. See Table 2 for a comparison of the most common adverse events following one and six week titration regimens.

Table 2. Comparison of Rates of Adverse Events in Patients Titrated to 10 mg/day Over 1 and 6 Weeks

	No titration		One-week titration	Six-week titration
Adverse Event	**Placebo (n=315)**	**5 mg/day (n=311)**	**10 mg/day (n=315)**	**10 mg/day (n=269)**
Nausea	6%	5%	19%	6%
Diarrhea	5%	8%	15%	9%
Insomnia	6%	6%	14%	6%
Fatigue	3%	4%	8%	3%
Vomiting	3%	3%	8%	5%
Muscle cramps	2%	6%	8%	3%
Anorexia	2%	3%	7%	3%

Adverse Events Reported in Controlled Trials The events cited reflect experience gained under closely monitored conditions of clinical trials in a highly selected patient population. In actual clinical practice or in other clinical trials, these frequency estimates may not apply, as the conditions of use, reporting behavior, and the kinds of patients treated may differ. Table 3 lists treatment emergent signs and symptoms that were reported in at least 2% of patients in placebo-controlled trials who received ARICEPT® and for which the rate of occurrence was greater for ARICEPT® assigned than placebo assigned patients. In general, adverse events occurred more frequently in female patients and with advancing age.

Table 3. Adverse Events Reported in Controlled Clinical Trials in at Least 2% of Patients Receiving ARICEPT® (donepezil HCl) and at a Higher Frequency than Placebo-treated Patients

Body System/Adverse Event	Placebo (n=355)	ARICEPT® (n=747)
Percent of Patients with any Adverse Event	72	74
Body as a Whole		
Headache	9	10
Pain, various locations	8	9
Accident	6	7
Fatigue	3	5
Cardiovascular System		
Syncope	1	2
Digestive System		
Nausea	6	11
Diarrhea	5	10
Vomiting	3	5
Anorexia	2	4
Hemic and Lymphatic System		
Ecchymosis	3	4
Metabolic and Nutritional Systems		
Weight Decrease	1	3
Musculoskeletal System		
Muscle Cramps	2	6
Arthritis	1	2
Nervous System		
Insomnia	6	9
Dizziness	6	8
Depression	<1	3
Abnormal Dreams	0	3
Somnolence	<1	2
Urogenital System		
Frequent Urination	1	2

Other Adverse Events Observed During Clinical Trials ARICEPT® has been administered to over 1700 individuals during clinical trials worldwide. Approximately 1200 of these patients have been treated for at least 3 months and more than 1000 patients have been treated for at least 6 months. Controlled and uncontrolled trials in the United States included approximately 900 patients. In regards to the highest dose of 10 mg/day, this population includes 650 patients treated for 3 months, 475 patients treated for 6 months and 116 patients treated for over 1 year. The range of patient exposure is from 1 to 1214 days. Treatment emergent signs and symptoms that occurred during 3 controlled clinical trials and two open-label trials in the United States were recorded as adverse events by the clinical investigators using terminology of their own choosing. To provide an overall estimate of the proportion of individuals having similar types of events, the events were grouped into a smaller number of standardized categories using a modified COSTART dictionary and event frequencies were calculated across all studies. These categories are used in the listing below. The frequencies represent the proportion of 900 patients from these trials who experienced that event while receiving ARICEPT®. All adverse events occurring at least twice are included, except for those already listed in Tables 2 or 3, COSTART terms too general to be informative, or events less likely to be drug caused. Events are classified by body system and listed using the following definitions: *frequent adverse events*—those occurring in at least 1/100 patients; *infrequent adverse events*—those occurring in 1/100 to 1/1000 patients. These adverse events are not necessarily related to ARICEPT® treatment and in most cases were observed at a similar frequency in placebo-treated patients in the controlled studies. No important additional adverse events were seen in studies conducted outside the United States. **Body as a Whole:** *Frequent:* influenza, chest pain, toothache; *Infrequent:* fever, edema face, periorbital edema, hernia hiatal, abscess, cellulitis, chills, generalized coldness, head fullness, listlessness. **Cardiovascular System:** *Frequent:* hypertension, vasodilation, atrial fibrillation, hot flashes, hypotension; *Infrequent:* angina pectoris, postural hypotension, myocardial infarction, AV block (first degree), congestive heart failure, arteritis, bradycardia, peripheral vascular disease, supraventricular tachycardia, deep vein thrombosis. **Digestive System:** *Frequent:* fecal incontinence, gastrointestinal bleeding, bloating, epigastric pain; *Infrequent:* eructation, gingivitis, increased appetite, flatulence, periodontal abscess, cholelithiasis, diverticulitis, drooling, dry mouth, fever sore, gastritis, irritable colon, tongue edema, epigastric distress, gastroenteritis, increased transaminases, hemorrhoids, ileus, increased thirst, jaundice, melena, polydipsia, duodenal ulcer, stomach ulcer. **Endocrine System:** *Infrequent:* diabetes mellitus, goiter. **Hemic and Lymphatic System:** *Infrequent:* anemia, thrombocythemia, thrombocytopenia, eosinophilia, erythrocytopenia. **Metabolic and Nutritional Disorders:** *Frequent:* dehydration; *Infrequent:* gout, hypokalemia, increased creatine kinase, hyperglycemia, weight increase, increased lactate dehydrogenase. **Musculoskeletal System:** *Frequent:* bone fracture; *Infrequent:* muscle weakness, muscle fasciculation. **Nervous System:** *Frequent:* delusions, tremor, irritability, paresthesia, aggression, vertigo, ataxia, increased libido, restlessness, abnormal crying, nervousness, aphasia; *Infrequent:* cerebrovascular accident, intracranial hemorrhage, transient ischemic attack, emotional lability, neuralgia, coldness (localized), muscle spasm, dysphoria, gait abnormality, hypertonia, hypokinesia, neurodermatitis, numbness (localized), paranoia, dysarthria, dysphasia, hostility, decreased libido, melancholia, emotional withdrawal, nystagmus, pacing. **Respiratory System:** *Frequent:* dyspnea, sore throat, bronchitis; *Infrequent:* epistaxis, post nasal drip, pneumonia, hyperventilation, pulmonary congestion, wheezing, hypoxia, pharyngitis, pleurisy, pulmonary collapse, sleep apnea, snoring. **Skin and Appendages:** *Frequent:* pruritus, diaphoresis, urticaria; *Infrequent:* dermatitis, erythema, skin discoloration, hyperkeratosis, alopecia, fungal dermatitis, herpes zoster, hirsutism, skin striae, night sweats, skin ulcer. **Special Senses:** *Frequent:* cataract, eye irritation, vision blurred; *Infrequent:* dry eyes, glaucoma, earache, tinnitus, blepharitis, decreased hearing, retinal hemorrhage, otitis externa, otitis media, bad taste, conjunctival hemorrhage, ear buzzing, motion sickness, spots before eyes. **Urogenital System:** *Frequent:* urinary incontinence, nocturia; *Infrequent:* dysuria, hematuria, urinary urgency, metrorrhagia, cystitis, enuresis, prostate hypertrophy, pyelonephritis, inability to empty bladder, breast fibroadenosis, fibrocystic breast, mastitis, pyuria, renal failure, vaginitis. **Postintroduction Reports** Voluntary reports of adverse events temporally associated with ARICEPT® that have been received since market introduction that are not listed above, and that there is inadequate data to determine the causal relationship with the drug include the following: abdominal pain, agitation, cholecystitis, confusion, convulsions, hallucinations, heart block (all types), hemolytic anemia, hepatitis, hyponatremia, neuroleptic malignant syndrome, pancreatitis, and rash. **OVERDOSAGE Because strategies for the management of overdose are continually evolving, it is advisable to contact a Poison Control Center to determine the latest recommendations for the management of an overdose of any drug.** As in any case of overdose, general supportive measures should be utilized. Overdosage with cholinesterase inhibitors can result in cholinergic crisis characterized by severe nausea, vomiting, salivation, sweating, bradycardia, hypotension, respiratory depression, collapse and convulsions. Increasing muscle weakness is a possibility and may result in death if respiratory muscles are involved. Tertiary anticholinergics such as atropine may be used as an antidote for ARICEPT® overdosage. Intravenous atropine sulfate titrated to effect is recommended: an initial dose of 1.0 to 2.0 mg IV with subsequent doses based upon clinical response. Atypical responses in blood pressure and heart rate have been reported with other cholinomimetics when co-administered with quaternary anticholinergics such as glycopyrrolate. It is not known whether ARICEPT® and/or its metabolites can be removed by dialysis (hemodialysis, peritoneal dialysis, or hemofiltration). Dose-related signs of toxicity in animals included reduced spontaneous movement, prone position, staggering gait, lacrimation, clonic convulsions, depressed respiration, salivation, miosis, tremors, fasciculation and lower body surface temperature. **DOSAGE AND ADMINISTRATION** The dosages of ARICEPT® shown to be effective in controlled clinical trials are 5 mg and 10 mg administered once per day. The higher dose of 10 mg did not provide a statistically significantly greater clinical benefit than 5 mg. There is a suggestion, however, based upon order of group mean scores and dose trend analyses of data from these clinical trials, that a daily dose of 10 mg of ARICEPT® might provide additional benefit for some patients. Accordingly, whether or not to employ a dose of 10 mg is a matter of prescriber and patient preference. Evidence from the controlled trials indicates that the 10 mg dose, with a one week titration, is likely to be associated with a higher incidence of cholinergic adverse events than the 5 mg dose. In open label trials using a 6 week titration, the frequency of these same adverse events was similar between the 5 mg and 10 mg dose groups. Therefore, because steady state is not achieved for 15 days and because the incidence of untoward effects may be influenced by the rate of dose escalation, treatment with a dose of 10 mg should not be contemplated until patients have been on a daily dose of 5 mg for 4 to 6 weeks. ARICEPT® should be taken in the evening, just prior to retiring, and may be taken with or without food.

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New York, NY 10017

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EL187X01RD

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breaking through the triple layer of Sheetrock only to find . . . still more Sheetrock. Mercifully, it was a single layer, three-quarters of an inch thick. Easily punched through. Finally, they pushed against a tile wall and found themselves underneath a sink in a men's room. "Wow!" Demczur thought, recognizing the site of one of his thrice-weekly cleaning assignments.

Soon they were out of the elevator cab and into the larger horror of crowded stairwells, dust, smoke, stinging eyes, peripheral explosions and all-out confusion. Through the chaos Demczur toted his bucket, abandoning it only in the final minutes. In his pocket, he stashed the squeegee handle, half expecting to need it and half "not knowing what I was doing."

When the tower collapsed—the second to do so—Demczur was standing outside, looking up, watching it wobble and then fall into itself. Approximately 90 minutes after the elevator cab had come to a stop, he and his mates had escaped with only minutes to spare. "That tool saved my life," Demczur said. "And [the lives of] five other people. I don't say that I did it by myself. We were all working together in order to save our lives."

—Victoria Dawson

Out of Afghanistan: Treasures from the Earth

"There are plenty of things that enlarge museum collections," says Jeff Post, the tall, genial curator of minerals at the Smithsonian's Museum of Natural History. "Clearly, one is political change."

Standing in a windowless, steel cabinet-lined storage room on the museum's fourth floor, Post grips a baseball-size agglomeration of electric-blue crystallized mineral as he talks. "Virtually anyplace on the planet," he says, "the ground has its own particular soils and minerals, which can't be replicated anywhere else."

The specimen he holds, called afghanite, is a rare mineral occurring within metamorphosed limestone. Like its blue-marbled cousin, lapis lazuli, afghanite comes from the Hindu Kush mountains of northern Afghanistan. Until recently, including the period that saw the rise of the Taliban during the 1990s, little afghanite has made it into the hands of dealers.

Post says a geologist building a museum collection has to have quick reflexes, "because once a unique deposit is played out, the specimens get scattered to museums and private collectors very quickly. The acquisition opportunity disappears."

Curator Jeff Post (with collections) oversees 400,000 specimens.

REGIS LEFEBURE (2)

As soon as the United States and its allies toppled the Taliban, Post headed for the world-renowned Tucson Gem and Mineral Show, held each February in Arizona, hoping—correctly, as it turned out—that some rare specimens might have bubbled out of the war-torn region.

He maintains that each of the half-dozen different rare minerals he bought will help visitors better understand the geologic forces at work in that part of the world. In addition to the afghanite, he acquired a green demantoid garnet from the Afghan-Iran border; various types of blue lazurite, from a region of northern Afghanistan, and several chunks of pale-purple sodalite, also from Afghanistan.

These specimens became available only because some areas of Afghanistan have begun to have contact with the outside world. "For better or for worse," Post says, "science has benefited from turmoil."

—Donovan Webster

Rare finds: afghanite crystals.

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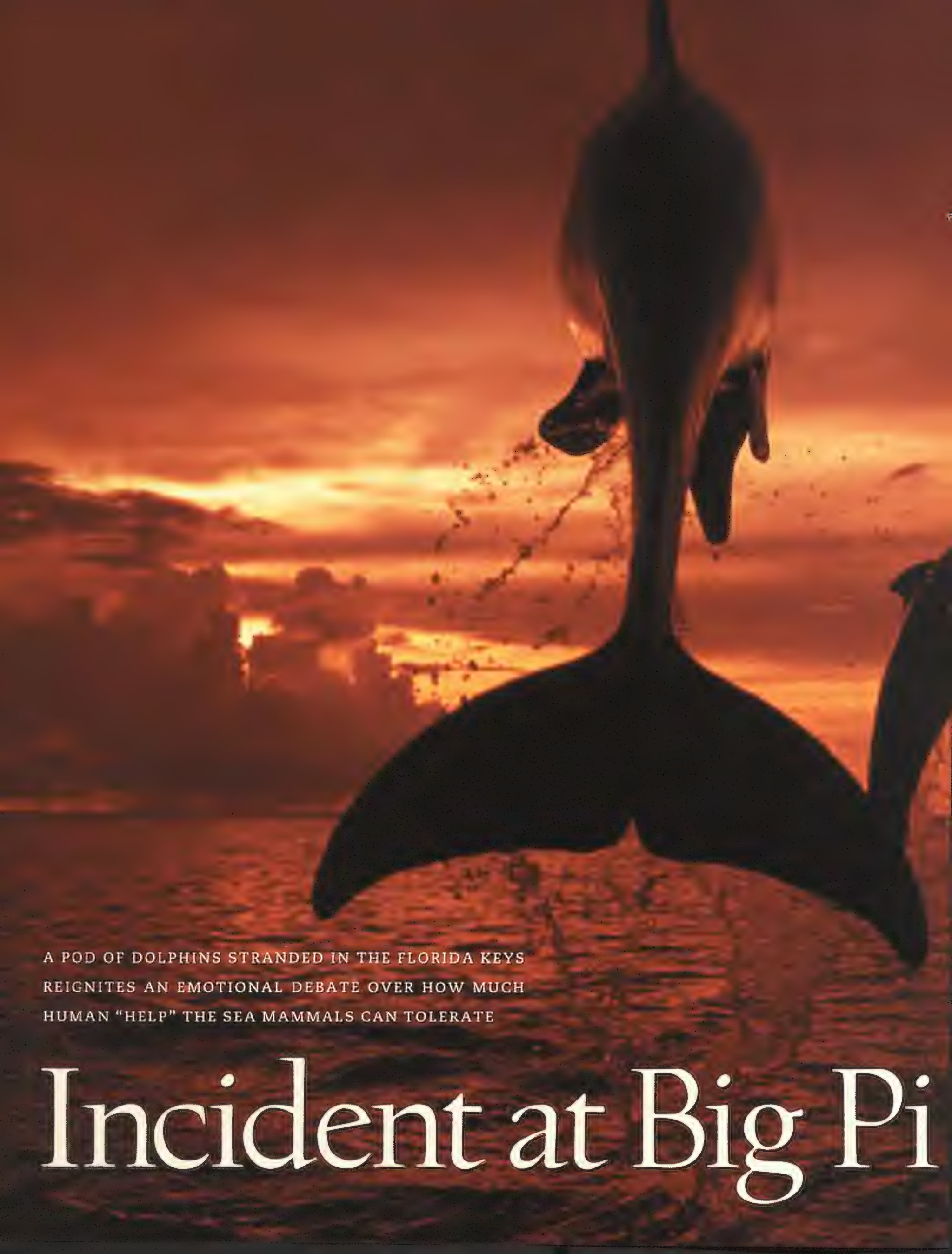


A POD OF DOLPHINS STRANDED IN THE FLORIDA KEYS REIGNITES AN EMOTIONAL DEBATE OVER HOW MUCH HUMAN "HELP" THE SEA MAMMALS CAN TOLERATE

Incident at Big Pi

ne Key

BY CLAUDIA GLENN DOWLING

THE WATER WAS AS MURKY AS MEMORY, BUT MARK AND Gretta Sleeper strapped on their fins, face masks and snorkels and eased into a canal on Big Pine Key, Florida, 120 miles south of Miami. Soon the vacationing couple heard clicking sounds, the sonarlike system marine mammals use to navigate. Sure enough, several adult dolphins and a calf swam into view. Gretta thought she detected a motif in the chatter—a few plaintive notes sounded over and over. It was Mark who saw the object of the animals' apparent attentions, a dolphin lying motionless on the bottom. He dived down and found that the dolphin was dead.

The Sleepers train riding horses back home in Bellville, Texas, and it might be said that what they did next was because they are animal lovers. But a lot of people would have made the same telephone call that October day. It's just that nobody could have predicted all the trouble it would stir up.

Over the next three months, the Sleepers found themselves at the center of a sometimes rancorous debate about the handling of dolphins in the Florida Keys. Tensions had been building for years as stalwart opponents disputed how to deal with sick or stranded dolphins, who can do it best and what to do with ailing dolphins once they've been rescued. Now, though, there would be fresh insults, allegations of harassment, threatened boycotts and peeved letters to newspapers. The controversy over wild dolphins that strand themselves would entangle not only local activists but also federal regulators. It would highlight the curiously passionate emotions that human beings hold for these wild creatures. And, perhaps most surprising of all, it would even do some good.

Scientists may debate the animal's intelligence, but no one doubts that dolphins enchant. Their seeming cheerfulness, improbable smile and indecipherable cackle, their sociability and the way they appear to dote on their young have earned them a special place not only in our hearts but in our laws. Although most dolphin species are not endangered, they are all covered by the Marine Mammal Protection Act of 1972, which was designed to prevent the theft of healthy animals and the mistreatment of stranded or hurt ones. Accordingly, a dolphin that has beached itself or is stranded outside its usual habitat can be approached only by a group with authorization from the National Marine Fisheries Service (NMFS).

As of last fall, only two organizations in the Keys were sanctioned by the NMFS to rescue wild dolphins, rehabilitate them and also return them to the sea. One was the

PHOTOGRAPHS BY BILL BALLENBERG

"Healthy animals may find themselves stranded because of strong social bonds," Charley Potter says.

Florida Keys Marine Mammal Rescue Team in Key West.

The group's organizer, Becky Arnold, got the Sleepers' call that day last fall. Arnold, 45, a veteran animal advocate with a passion for dolphins, drove the 30 miles north to Big Pine Key. There, with her volunteer helpers, she retrieved the eight-foot-long carcass. It was a male Atlantic spotted dolphin, *Stenella frontalis*, seldom found in the shallows of the Keys, where the familiar bottlenose dolphin, *Tursiops truncatus*, predominates. Arnold, following standard procedure, arranged to have the carcass trucked to Miami for an autopsy at a federal fisheries laboratory, which has long gathered information on marine mammal deaths.

Normally, bottlenose and spotted dolphins live about 25 years, and some may live 50 years. (The longest-lived in the dolphin family, the killer whale, may live to nearly 90.) Dolphins' longevity, combined with the hundreds of miles they travel and the long time they nurse their young—up to two years—contribute to the sympathy that people feel for stranded dolphins.

Last year, 214 dolphins were stranded in Florida. Out of 11 stranded in the Keys, 9 were alive at the time rescuers arrived. All died. Typically, though, most dolphins counted as stranded are already dead, complicating the question of whether strandings are on the rise.

Stranded dolphins (like this baby *Stenella frontalis* in Tarpon Springs, Florida, in 1995) evoke impassioned feelings among their many advocates, though few animals survive.

But Stephen McCulloch, a biologist at the Harbor Branch Oceanographic Institution in Fort Pierce, Florida, says strandings have increased dramatically in a 156-mile-long area of the Atlantic coast that he and his coworkers monitor. Compared with the usual 25 to 30 instances a year, he says, more than 100 animals stranded themselves in 2001.

Scientists don't understand all the reasons for strandings, but some causes are clear, such as when dolphins are rammed by boats, entangled by fishing gear, choked by plastic trash or poisoned by man-made chemicals. Then, too, there are animals suffering from infections and other ailments. Curiously, multiple dolphins sometimes are stranded together, according to Charley Potter and Jim Mead, marine mammalogists at the Smithsonian Institution who have been collecting and closely studying stranded marine animals since 1971. "Perfectly healthy animals may find themselves stranded because of strong social bonds," Potter says. "The causes of these events are often more difficult to pinpoint, as only a few members of a pod may be ill or traumatized."

AT THE TIME THAT ARNOLD COLLECTED the dolphin carcass at Big Pine Key and afterward, she checked on its podmates and didn't see them in the canal. "I hoped they would simply go on with their lives," she recalls.

What happened next—or didn't happen, as the case may be—is at the core of the dispute. Five days after the discovery of the dead male, Arnold returned and observed that the lone calf appeared to be nursing, and the others were swimming and breathing normally. A more thorough health assessment—which involves capturing a dolphin to sample its blood and perform other tests—would have been risky and didn't seem warranted, she says. Besides, she and other approved rescuers require special permission to capture a free-swimming dolphin. Even then, there's no guarantee of success. "If I get a bunch of volunteers and throw nets in the water and drown these dolphins, that would be a problem," she says.

For their part, the Sleepers say that the pod members showed clear signs of growing weaker in the days after they found the dead male. Still, they spent hours swimming with the animals. But they and other advocates later argued that rescuers should have aided the animals before it was too late.

JOAN KADEL FENTON/ST PETERSBURG TIMES; PP. 44,45 BRANDON COLE

Within two weeks after the first dolphin turned up dead, the rest of the pod—all five—died of starvation, according to autopsy reports.

Janet Whaley, a veterinarian and toxicologist who is the coordinator of the National Stranding Network at NMFS, headquartered in Silver Spring, Maryland, was aware of a problem at Big Pine Key and says she was ready to respond. But the animals, she was told at the time, seemed capable of swimming back out to sea, and so a risky in-the-water rescue was not called for. "This is a very sensitive species," she says, "and they were in a canal near open water."

Gretta Sleeper, home in Texas, was shocked by the news of the dolphins' demise. "I cried for three days," she says. "It was like I'd made best friends and found out they'd died one week later. I felt so powerless and so mad."

Tensions rose after Gretta Sleeper (with husband, Mark, at home in Texas) filed a complaint saying officials botched the rescue of the dolphins stranded at Big Pine Key.

IT WOULD BE HARD TO PICK A MORE colorful backdrop for this drama than the Florida Keys, the archipelago of 1,800 islands that dangles from the mainland like an afterthought. The region is also known as the Conch Republic, so dubbed by the then-mayor of Key West in 1982 when he declared, only half in jest, that the Keys would secede from the United States. But for many citizens of this self-styled republic, who take pride in their feisty independence, dolphins are a more apt emblem than the conch, a pink-shelled mollusk no longer in abundance in these waters. People gather at shorelines and canal banks and at five marine parks in the Keys to watch dolphins gambol, and dolphin advocacy groups are almost as common as bonefishers.

Yet if feelings about dolphins run deep, they certainly don't run in the same direction. There are dolphin advocates whose earnestness suggests they prefer the marine mammal to their own species. There are those who try to balance the animal's "rights" against the desire of scientists and the public to

"I can Monday-morning quarterback, but no one knew that [starvation killed the animals] until after they were dead," says beleaguered rescue leader Becky Arnold.

TOP: PAM FRANCIS

"I'm not a bunny hugger," says cetacean champion Russ Rector. "I'm trying to pass on what I know."

get closer to them. And there are those who don't see what all the fuss is about. "Dolphin?" an old salt at the Schooner Wharf Bar in Key West was heard to muse. "It tastes a lot like manatee. Like bald eagle, only not as stringy."

GRETTA SLEEPER MIGHT HAVE LET THE Big Pine Key incident rest had she not made contact with Russ Rector and Rick Trout, dolphin trainers-turned-activists who are among the most unyielding—some say hostile—animal activists in the Sunshine State.

Russ Rector (in eyepatch with Marine Mammal Conservancy members Spencer Slate and December Lauretano) has often found himself at the center of controversy.

Rector, 54, betrays the zeal of a convert. Beginning at age 21, he worked for seven years at Ocean World, a marine mammal park in Fort Lauderdale. He gradually came to believe that dolphin trainers used cruel methods—including punishment and hunger, he says—to make the animals do tricks. In time he went over to the other side, forming the Dolphin Freedom Foundation and pressuring Ocean World to shut its doors, which it did in 1995. "I closed it down," Rector boasts. He says he was once arrested by federal agents after attempting to stop a U.S. Navy underwater demolition test in waters near the Keys, which he argued would harm sea animals, especially dolphins. With a black eyepatch and beard, he has a piratical air. "You don't meet too many one-eyed guys with vision," he jokes. "I'm not a bunny hugger. I had the luck to work with dolphins, and I'm just trying to pass on what I know."

Perhaps inevitably, Rector made common cause with Rick Trout, 51, a onetime dolphin handler at the Flipper Sea School (now the Dolphin Research Center on Grassy Key) who says he went on to train dolphins for the U.S. Navy. In 1988, Trout alleged in newspaper and TV news interviews that the Navy was mistreating its dolphins. He and others claimed that the Navy tested dolphin "missiles" equipped with lethal carbon dioxide charges or bullets that would kill enemy scuba divers—and in the process, the dolphins.

The Navy denies that Trout ever worked for the service, saying that a private defense contractor in San Diego employed him as a sea lion trainer and that he once participated in a Navy exercise in which dolphins served as sentinels, not missiles. "The Navy does not now train, nor has it ever trained, any marine mammals to serve as offensive weapons," says Tom LaPuzza, spokesman for the Navy's Marine Mammal Program.

For much of the '90s, Trout worked as a dolphin rescue volunteer for the Marine Mammal Conservancy, a Key Largo-based organization that was authorized to respond to strandings because of its ties to Arnold's Key West organization. (One group with authorization can extend the privilege to another.) But political differences between Trout and Arnold's group widened, so Arnold withdrew the authorization privilege and effectively blocked the

conservancy from conducting rescues.

Arnold's action was only the latest twist in the perpetually baroque politics of dolphin rescue in Florida, but it set the tone for what was to come at Big Pine Key. By then, there were plenty of hard feelings to go around, and plenty of people in a mood to place blame when those six animals turned up dead.

After word of the incident spread, Trout checked it out and got in touch with the Sleepers in Texas, who then contacted Rector for details on how to lodge an official complaint. In December, the Sleepers did just that, writing to the NMFS that "nothing had been done for this pod of dolphins except to collect their dead remains. If this is the procedural system that the current Marine Mammal Laws outline, the system is obviously not working!"

"I can be very forceful," says commercial diver Rick Trout, a veteran agitator in the long-running Florida Keys dolphin controversy. "I have a voice that scares children and animals."

THE QUESTION OF HOW TO RESPOND to stranded dolphins is further complicated by an emotional debate over the ethics of keeping dolphins in captivity. In the past, rescued dolphins were not always returned to the sea but were placed in marine parks or facilities where people can swim with the animals. Radical activists decried the practice, saying that dolphins in distress should be treated and returned to the wild. They believe that cetaceans—whales, dolphins and porpoises—are highly intelligent and that to confine a wild dolphin is tantamount to slavery.

Despite compelling evidence that dolphins communicate with one another, perhaps even by name, not all marine biologists agree that dolphins and other cetaceans are especially smart. Though a dolphin has an impressive ability to be trained to perform tricks, skeptics say that this behavior reflects not intelligence—the capacity to make choices based on weighing possible consequences—but conditioning, a programmed response to a stimulus like food. In that view, dolphins are no more intelligent than dogs, horses or, for that matter, parrots. In addition, notions about dolphins' exceptional intelligence have been based on the observation that they have disproportionately large brains. Again, some scientists point out that the animal's brain is likely wired chiefly for sonar processing and motor control, not "thinking."

In the Keys, at any rate, the old battle lines over dolphin captivity shaped the response to the Big Pine Key incident. Arnold says Trout has long tried to co-opt dolphin rescue volunteers to his anti-captivity crusade. "Rick went on the anti-captivity trail and made a lot of enemies," she says. Trout admits that he can be "very forceful," adding, "I would not want to be on the other side of a disagreement with me or Russ."

Trout and Rector also seized upon the Big Pine Key incident to publicize their belief that dolphin rescues are being botched. They claim that Trout's group saved half of the stranded animals to which it responded—a far better record, they say, than that of other rescue groups.

But the activists have detractors. Among Trout's is a former employer, the Dolphin Research Center, which issued a blistering condemnation of his deeds. "Three decades of continuous eco-terrorist activities is enough for us to know that [the Marine Mammal Conservancy] and Rick Trout are a dangerous, impervious-to-regulations, egotistical, self-serving, slanderous group that is incapable of teamwork," the center's vice president, Mandy Rodriguez, wrote last December. "We do

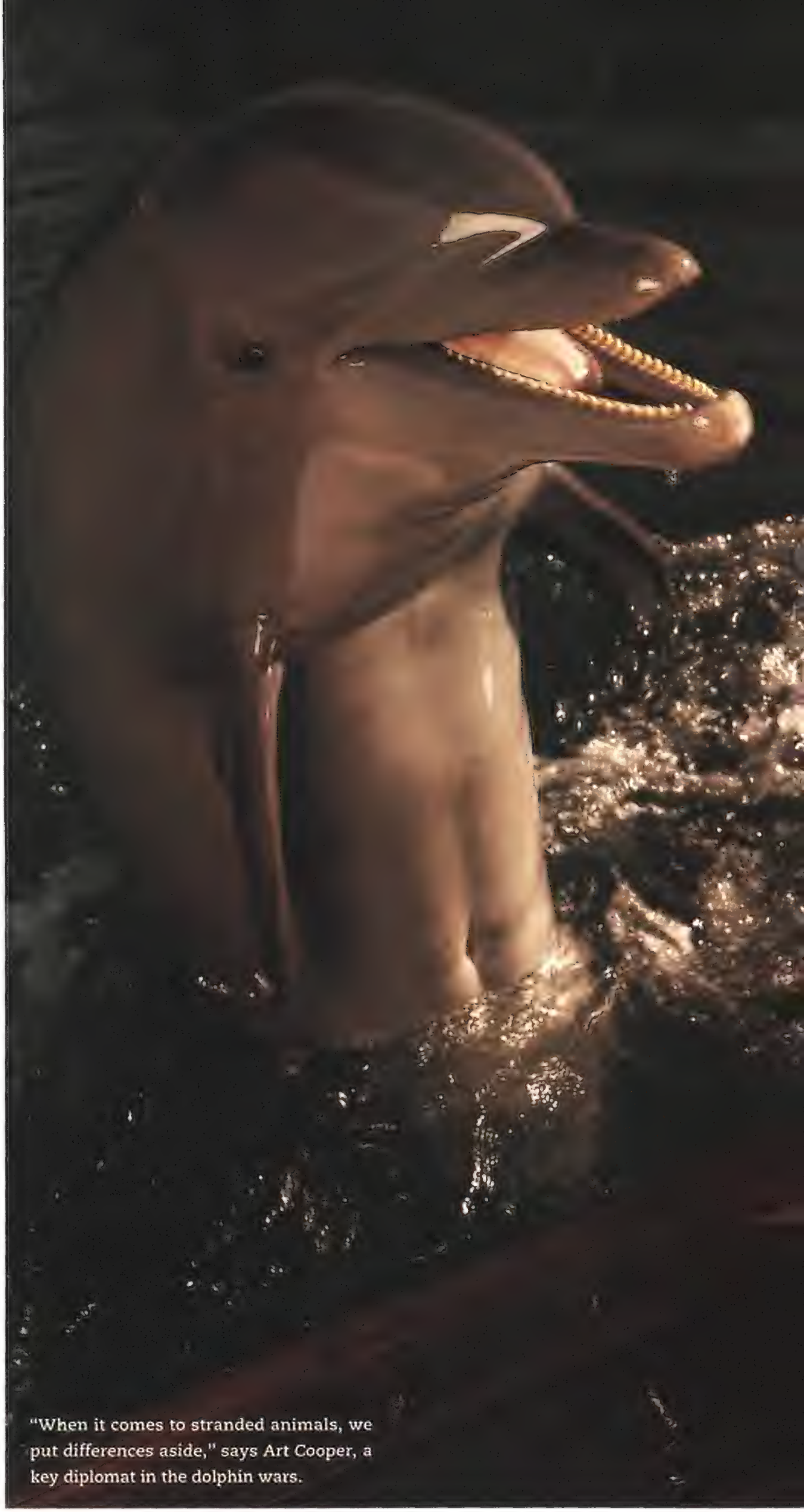
not negotiate on any level with a terrorist organization."

In January, as tensions peaked, federal officials held a special meeting on Marathon Key to address the dolphin rescue quandary. Most of the central players were there, including Whaley, of the NMFS, who flew down from Washington. The Big Pine Key incident wasn't the only item on the agenda, but it was a hot topic. "Some of the officials were very interested in why, when one dolphin died, something wasn't done, and why, when two more died, something still wasn't done," says Robert Lingenfelser, a construction contractor and head of the Marine Mammal Conservancy.

The meeting wasn't exactly Potsdam, but the old factions did reach a significant agreement: nobody wanted to ship ailing animals all the way to Miami for rehabilitation, lately the only recourse given that no long-term rehabilitation center exists in the Keys. So when the meeting ended and Whaley returned to Washington, a crucial question hung in the air: Would the Keys get its own dolphin hospital?

Lingenfelser's group has long had the equipment to rescue and care for dolphins, including a trailer stocked with rescue gear such as an inflatable rubber boat; a natural lagoon for treating dolphins; and even local permits for the facility. What the group didn't have was federal authorization, and the main reason for the snub, says Lingenfelser, was his affiliation with Trout. "Rick Trout has a gift," he says, and, despite Trout's abrasive ways, even his detractors acknowledge that few people work better in the water with dolphins.

Two developments in particular made resolution of the controversy possible. For one, Lingenfelser was in place to serve as a bridge between the rival extremes. He had ties not only to the radical Trout but also to Art Cooper, a curator at Dolphins Plus, a swim-with-dolphins facility in Key Largo. Cooper,



"When it comes to stranded animals, we put differences aside," says Art Cooper, a key diplomat in the dolphin wars.

33, says the ten dolphins kept in his care are happy and living on a diet of gourmet fish. "Only the best quality," he says. "Sardines from Venezuela, herring from Nova Scotia, Canadian silverside, California mackerel."

Then, in April, NMFS officials took a step that might appear trivial but in fact constituted a diplomatic breakthrough in the Dolphin Wars. The officials granted yet another cetacean advocacy group, the Marine Mammal Foundation of the Upper Keys—which Cooper runs—full authority not only to handle stranded or distressed dolphins but also to rehabilitate and return them to the sea. Then, Cooper extended his authorization to Lingenfelser's organization, putting the Marine Mammal Conservancy back in the rescue business. And after local dolphin lovers donated thousands of dollars, Lingenfelser broke ground for a new dolphin clinic in Key Largo (scheduled to open next month). "I'm just happy that we're authorized, and the animals are getting the help they need," he says.

Even relations among the factions have improved. After a dwarf sperm whale washed up on Grassy Key last April, Trout and Lingenfelser got to the whale right away, but the animal died. Arnold congratulated the pair on their quick response. "That was surprising, and *nice*," says Lingenfelser.

Mark and Gretta Sleeper are pleased with the developments that they set in motion. "We were just tourists—not involved with the political mess out there," says Mark. Gretta says the struggle was worth it: "Those dolphins gave their lives for these changes."

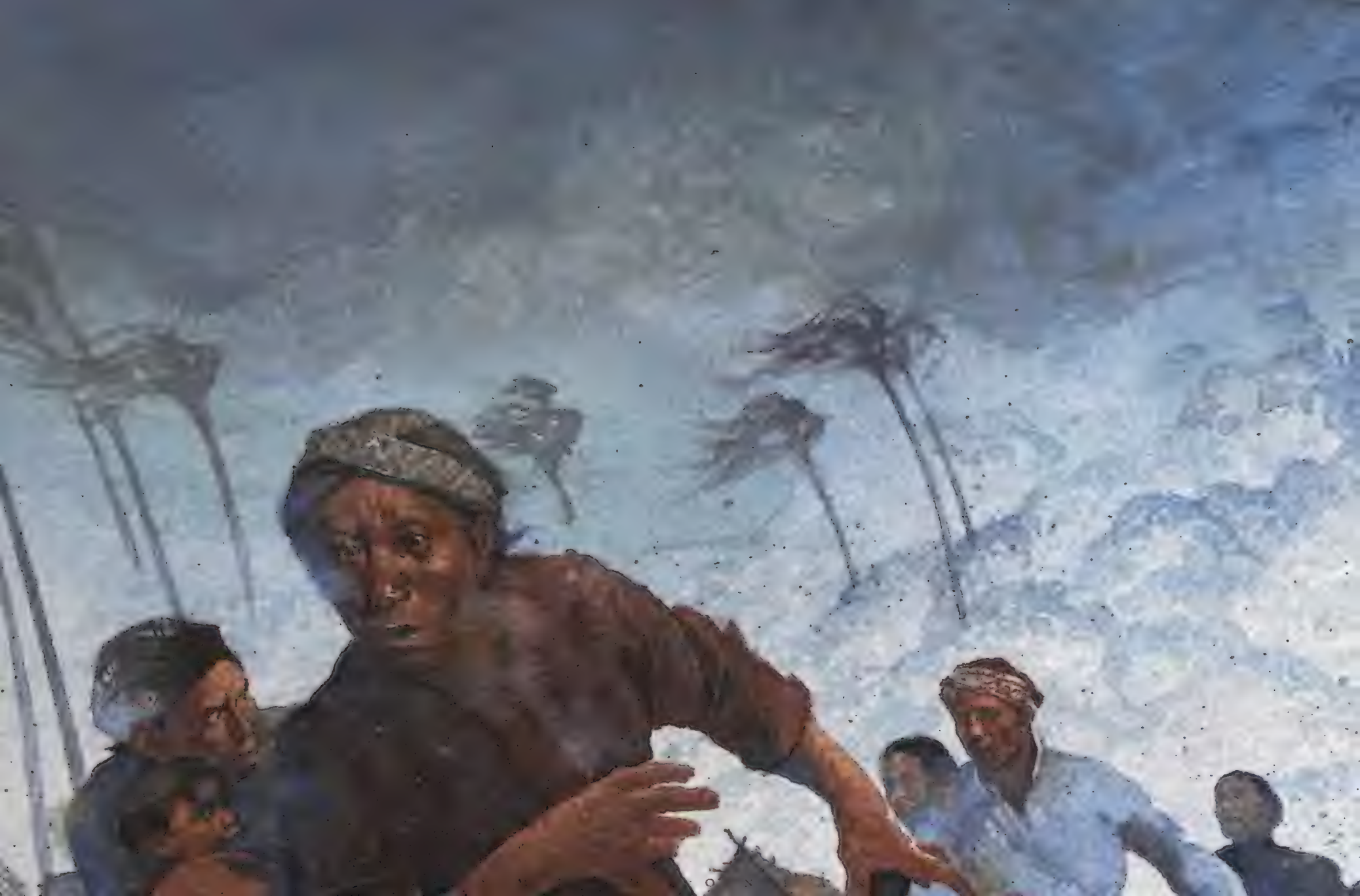
For Whaley, the incident at Big Pine Key underscores the animal's peculiar hold on our imagination. Dolphins, she says, "bring out the best and the worst in people."

Claudia Glenn Dowling is profiled in "Editor's Inkwell," page 13. Bill Ballenberg's work last appeared in May 2000.

BLAST FROM THE PAST

THE ERUPTION OF MOUNT TAMBORA KILLED THOUSANDS, PLUNGED MUCH OF THE WORLD INTO A FRIGHTFUL CHILL AND OFFERS LESSONS FOR TODAY

BY ROBERT EVANS ◆ ILLUSTRATIONS BY GREG HARLIN



Rapid cooling of burning ash that poured from the volcano formed pumice that choked harbors, disrupting trade and travel for months.

THE MOST DESTRUCTIVE EXPLOSION ON EARTH IN THE PAST 10,000 years was the eruption of an obscure volcano in Indonesia called Mount Tambora. More than 13,000 feet high, Tambora blew up in 1815 and blasted 12 cubic miles of gases, dust and rock into the atmosphere and onto the island of Sumbawa and the surrounding area. Rivers of incandescent ash poured down the mountain's flanks and burned grasslands and forests. The ground shook, sending tsunamis racing across the Java Sea. An estimated 10,000 of the island's inhabitants died instantly.

It's the eruption's far-flung consequences, however, that have most intrigued scholars and scientists. They have studied how debris from the volcano shrouded and chilled parts of the planet for many months, contributing to crop failure and famine in North America and epidemics in Europe. Climate experts believe that Tambora was partly responsible for the unseasonable chill that afflicted much of the Northern Hemisphere in 1816, known as the "year without a summer." Tamboran gloom may have even played a part in the creation of one of the 19th century's most enduring fictional characters, Dr. Frankenstein's monster.

The eruption of Tambora was ten times more powerful than that of Krakatau, which is 900 miles away. But Krakatau is more widely known, partly because it erupted in 1883, after the invention of the telegraph, which spread the news quickly. Word of Tambora traveled no faster than a sailing ship, limiting its notoriety. In my 40 years of geological work I had never heard of Tambora until a couple of years ago when I started researching a book on enormous natural disasters.

The more I learned about the eruption of Tambora, the more intrigued I became, convinced that few events in history show more dramatically how earth, its atmosphere and its inhabitants are interdependent—an important matter given concerns such as global warming and destruction of the atmosphere's protective ozone layer. So when the

chance arose to visit the volcano while on a trip last fall to Bali and other Spice Islands, I took it.

Indonesia's Directorate of Volcanology and Geologic Hazard Mitigation said that I should not attempt to climb Tambora—too dangerous. As my guide would later tell me, the name of the mountain means "gone" in a local language, as in people who have vanished on its slopes. But researchers who have studied the volcano encouraged me. "Is it worth it?" I asked Steve Carey, a volcanologist at the University of Rhode Island, who has made the climb. "Oh, my!" he said. That was all I needed to hear.

Through a travel agent in Bima, a city on Sumbawa, a friend and I hired a guide, a translator, a driver, a driver's mate, a cook and six porters. We filled a van and traveled for hours, weaving among horse-drawn carriages (known locally as Ben-Hurs, after the chariots in the movie) as we headed for Tambora's southern slope. The parched terrain was like savanna, covered with tall grasses and only a few trees. A few hours west of Bima, the huge bulk of Tambora begins to dominate the horizon. Formerly a cone or double-cone, it's now shaped like a turtle's shell: the eruption reduced the mountain's height by more than 4,000 feet.

We camped a third of the way up the mountain, and set out at dawn for the summit, wending around boulders the size of small cars that were tossed like pebbles from the erupting volcano nearly two centuries ago. Our guide, Rahim, chose a trail that switched back and forth for about four miles. The day was warm and humid, the temperature in the 70s. Grasses in places were charred black, burned by hunters in pursuit of deer.

I was excited to approach the site of one of the most important geological events since human beings first walked the planet. Yet as I looked up at the mountain, I realized I had another purpose in mind. The climb was a chance to reassure myself that after treatment for two kinds of cancer in the past decade, I could still master such a challenge. For me, then, it was a test. For the two porters, striding along in flip-flops, it was a pleasant stroll in the country.

IN REPOSE FOR THOUSANDS OF YEARS, THE VOLCANO began rumbling in early April of 1815. Soldiers hundreds of miles away on Java, thinking they heard cannon fire, went looking for a battle. Then, on April 10, came the volcano's terrible finale: three columns of fire shot from the mountain, and a plume of smoke and gas reached 25 miles into the atmosphere. Fire-generated winds uprooted trees. Pyroclastic flows, or incandescent ash, poured down the slopes at more than 100 miles an hour, destroying everything in their paths and boiling and hissing into the sea 25 miles away. Huge floating rafts of pumice trapped ships at harbor.

Throughout the region, ash rained down for weeks. Houses hundreds of miles from the mountain collapsed under the debris. Sources of fresh water, always scarce, became contaminated. Crops and forests died. All told, it was the deadliest eruption in history, killing an estimated 90,000 people on Sumbawa and neighboring Lombok, most of them by starvation.

The major eruptions ended in mid-July,

Tambora, south of the Equator, is one of 129 volcanoes in Indonesia.

but Tambora's ejecta would have profound, enduring effects. Great quantities of sulfurous gas from the volcano mixed with water vapor in the air. Propelled by stratospheric winds, a haze of sulfuric acid aerosol, ash and dust circled the earth and blocked sunlight.

In China and Tibet, unseasonably cold weather killed trees, rice, and even water buffalo. Floods ruined surviving crops. In the northeastern United States, the weather in mid-May of 1816 turned "backward," as locals put it, with summer frost striking New England and as far south as Virginia. "In June . . . another snowfall came and folk went sleighing," Pharaoh Chesney, of Virginia, would later recall. "On July 4, water froze in cisterns and snow fell again, with Independence Day celebrants moving inside churches where hearth fires warmed things a mite." Thomas Jefferson, having retired to Monticello after completing his second term as President, had such a poor corn crop that year that he applied for a $1,000 loan.

ALL ILLUSTRATIONS: GREG HARLIN/WOOD RONSAVILLE HARLIN

A year after the eruption, the effects were felt in the northeastern United States, where vital corn crops withered from killing frosts.

Failing crops and rising prices in 1815 and 1816 threatened American farmers. Odd as it may seem, the settling of the American heartland was apparently shaped by the eruption of a volcano 10,000 miles away. Thousands left New England for what they hoped would be a more hospitable climate west of the Ohio River. Partly as a result of such migration, Indiana became a state in 1816 and Illinois in 1818.

Climate experts say that 1816 wasn't the coldest year on record, but the long cold snap that coincided with the June-to-September growing season was a hardship. "The summer of 1816 marked the point at which many New England farmers who had weighed the advantages of going west made up their minds to do so," the oceanographer Henry Stommel and his wife, Elizabeth, wrote in their 1983 book about Tambora's global effects, *Volcano Weather*. If the ruinous weather wasn't the only reason for the emigration, they note, it played a major part. They cite historian L. D. Stillwell, who estimated that twice the usual number of people left Vermont in 1816 and 1817—a loss of some 10,000 to 15,000 people, erasing seven years of growth in the Green Mountain State.

In Europe and Great Britain, far more than the usual amount of rain fell in the summer of 1816. It rained nonstop in Ireland for eight weeks. The potato crop failed. Famine ensued. The widespread failure of corn and wheat crops in Europe and Great Britain led to what historian John D. Post has called "the last great subsistence crisis in the western world." After hunger came disease. Typhus broke out in Ireland late in 1816, killing thousands, and over the next couple of years spread through the British Isles.

Researchers today are careful not to blame every misery of those years on the Tambora eruption, because by 1815 a cooling trend was already under way. Also, there's little evidence that the eruption affected climate in the Southern Hemisphere. In much of the Northern Hemisphere, though, there prevailed "rather sudden and often extreme changes in surface weather after the eruption of Tambora, lasting from one to three years," according to a 1992 collection of scientific studies titled *The Year Without a Summer?: World Climate in 1816*.

In Switzerland, the damp and dark year of 1816 stimulated Gothic imaginings that still entertain us. Vacationing near Lake Geneva that summer, Lord Byron, Percy Bysshe Shelley and his soon-to-be wife, Mary Wollstonecraft, and some friends sat out a June storm reading a collection of German ghost stories. The mood was captured in Byron's "Darkness," a narrative poem set when the "bright sun was extinguish'd" and "Morn came and went—and came, and brought no day." He challenged his companions to write their own macabre stories. John Polidori wrote *The Vampyre*, and the future Mary Shelley, who would later recall that inspirational season as "cold and rainy," began work

The eruption reduced Tambora's height by more than 4,000 feet, leaving a barren (and seldom-visited) crater over three miles wide.

on her novel, *Frankenstein*, about a well-meaning scientist who creates a nameless monster from body parts and brings it to life by a jolt of laboratory-harnessed lightning.

For Mary Shelley, *Frankenstein* was primarily an entertainment to "quicken the beatings of the heart," she wrote, but it has also long served as a warning not to overlook the consequences of humanity's tampering with nature. Fittingly, perhaps, the eruption that probably influenced the invention of that morality tale has, nearly two centuries later, taught me a similar lesson about the dangers of humanity's fouling our own atmosphere.

AFTER SEVERAL HOURS OF HARD, SLOW CLIMBING, DURING which I stopped frequently to drink water and catch my breath, we reached the precipice that is the southern rim of Tambora. I stared in silent awe down the volcano's throat. Clouds on the far side of the great crater formed and reformed in the light breeze. A solitary raptor sailed the currents and updrafts.

Three thousand feet deep and more than three miles across, the crater was as barren as it was vast, with not a single blade of grass in its bowl. Enormous piles of rubble, or scree, lay at the base of the steep crater walls. The floor was brown, flat and dry, with no trace of the lake that is said to collect there sometimes. Occasional whiffs of sulfurous gases warned us that Tambora is still active.

We lingered at the rim for a couple of hours, talking quietly and shaking our heads at the immensity before us. I tried to conceive of the unimaginable noise and power of the eruption, which volcanologists have classified as "super-colossal." I would have liked to stay there much longer. When it was time to go, Rahim, knowing that I would probably never return, suggested I say good-bye to Tambora, and I did. He stood at the rim, whispering a prayer to the spirits of the mountain upon whose flanks he has lived most of his life. Then we made our descent.

Looking into that crater, and having familiarized myself with others' research on the consequences of the eruption, I saw as if for the first time how the planet and its lifeforms are linked. The material that it ejected into the atmosphere perturbed climate, destroyed crops, spurred disease, made some people go hungry and others migrate. Tambora also opened my eyes to the idea that what human beings put into the atmosphere may have profound impacts. Interestingly, scientists who study global climate trends use Tambora as a benchmark, identifying the period 1815 to 1816 in ice cores from Greenland and Antarctica by their unusually high sulfur content—signature of a great upheaval long ago and a world away.

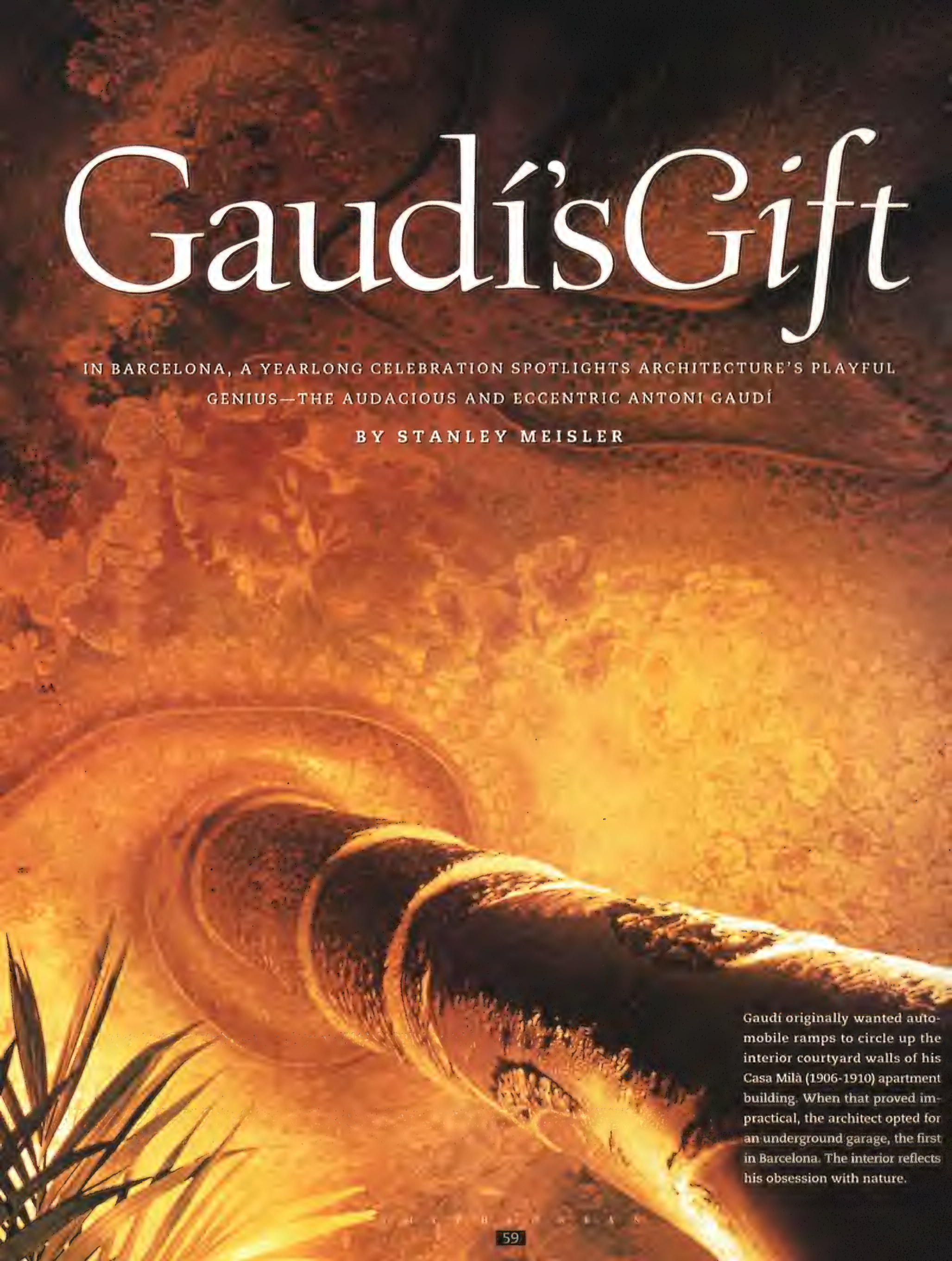
A former geologist, Robert Evans is a writer in California. Greg Harlin's illustrated book, Paul Revere's Midnight Ride, *appears this fall.*

DAN PORTER

Gaudí's Gift

IN BARCELONA, A YEARLONG CELEBRATION SPOTLIGHTS ARCHITECTURE'S PLAYFUL GENIUS—THE AUDACIOUS AND ECCENTRIC ANTONI GAUDÍ

BY STANLEY MEISLER



Gaudí originally wanted automobile ramps to circle up the interior courtyard walls of his Casa Milà (1906-1910) apartment building. When that proved impractical, the architect opted for an underground garage, the first in Barcelona. The interior reflects his obsession with nature.

Gaudí (left, with Cardinal Ragonesi at the Sagrada Família c. 1915) grew increasingly religious as he aged.

WHEN I FIRST CAME UPON THE STARTLING AND FANCIFUL WORKS OF ANTONI GAUDÍ A quarter of a century ago, I assumed he must have been some kind of freakish genius who created wonderful art out of his wild imagination, without regard to other architects or any artist before or during his time. I also thought that the Barcelona architect now being honored by that city's "International Gaudí Year" celebrations was one of a kind, and that his fantastic curving structures, shattered-tile chimneys, lavish decoration and bizarre towers stood alone.

I soon found, however, that this assumption troubled my Barcelona friends. To them, Gaudí was deeply rooted in the history of Catalonia, their region of Spain, and in the fashion of Art Nouveau that stirred such centers of culture as Paris, Vienna, Brussels, Glasgow, Munich and Barcelona at the turn of the 20th century. I was making the common error of an outsider encountering the greatness of Gaudí for the first time.

This was driven home to me one evening by Miquel de Moragas, a professor of communications at the Autonomous University of Barcelona, who took me on a breakneck tour of the city. Knowing of my interest in Gaudí, Moragas, the enthusiastic, fast-talking son of a distinguished Barcelona architect, whipped his Renault in and out of honking traffic, slammed to a sudden stop at street corners, pointed to elaborately curved and decorated buildings, and shouted above the din each time, "*Modernismo*." That is the Spanish term denoting the Art Nouveau era in Barcelona.

The 15 or so buildings selected by Moragas were all Gaudí-like, but none were by Gaudí. Moragas was not trying to downgrade Gaudí. He looks on him as a colossus of Catalonia, one of the great cultural gifts of Barcelona to the world. He believes that Gaudí's originality put him steps ahead of his main rivals in architectural Art Nouveau in Barcelona. But, as Moragas emphasized, "Gaudí was not alone."

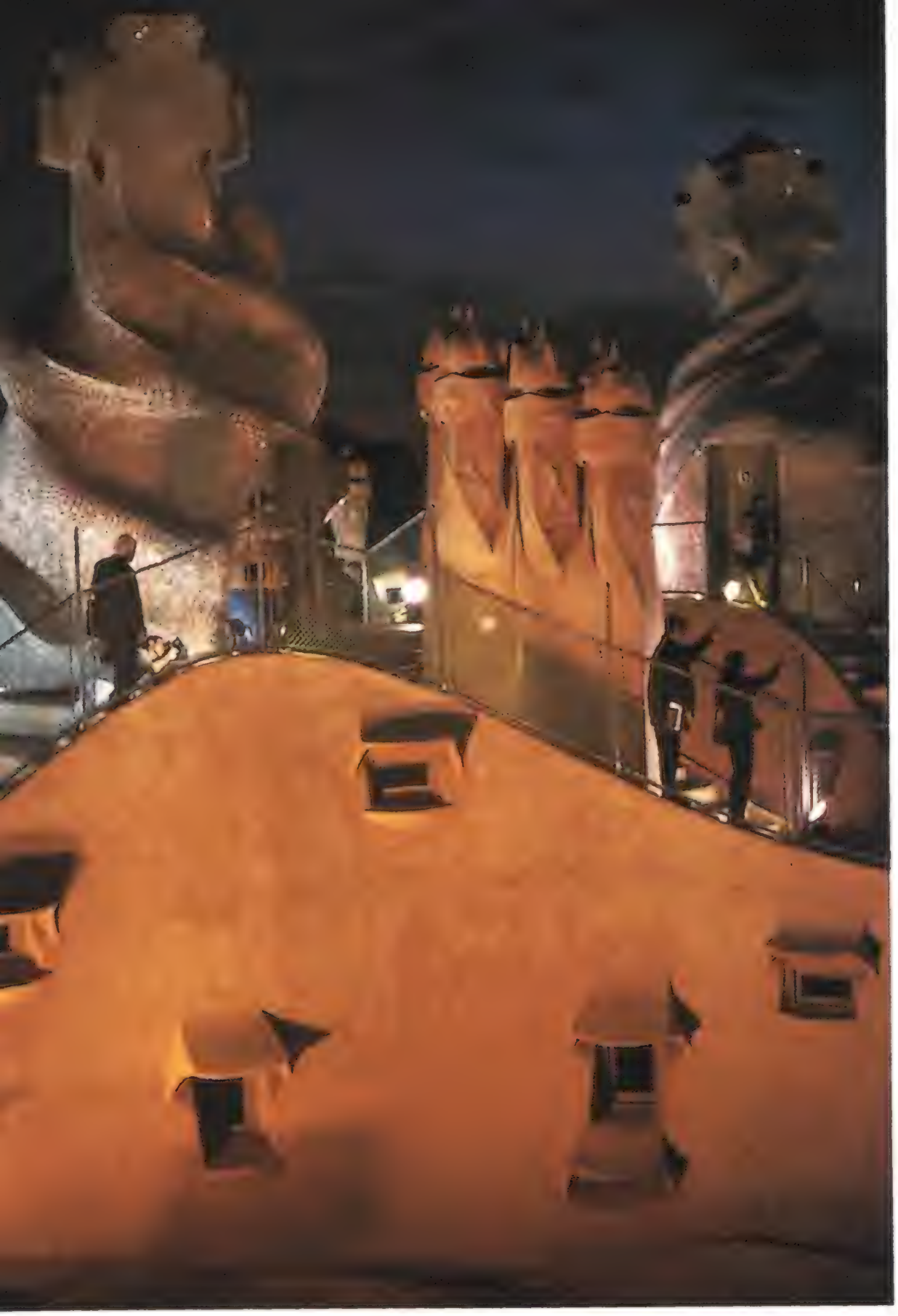
It is a truth worth keeping in mind as Barcelona commemorates the 150th anniversary of the architect's birth this year. The extraordinary attention may entice visitors into making my mistake. But Gaudí is best understood by placing him in the artistic, social and political context of his time and city.

Barcelona, the capital of Catalonia (the northeastern region of Spain, which was an independent state until the 15th century) and the center of Catalan culture, needs no Gaudí celebration to attract tourists. In 2001, some 3.4 million of them (more than twice the city's population) came to the Mediterranean metropolis, many of them lured by Gaudí. Year-round, crowds gape at the grand twists of his imagination: the soaring towers of the Sagrada Família, the huge, awe-inspiring church still under construction; the breathtaking, undulating facade of La Pedrera, the apartment building, also called Casa Milà, that hovers over the fashionable Passeig de Gràcia boulevard; and the gigantic mosaic lizard that guards the playful Park Güell on the outskirts of Barcelona. In fact, Gaudí's Sagrada Família, the most popular tourist site in the city, has become its symbol, nearly as emblematic as the Eiffel Tower or the Statue of Liberty. The facade and towers of this uncompleted church adorn T-shirts, scarves, platters, posters, mousepads, guidebooks and postcards galore.

Barcelona officials say they want the commemorative year to deepen the Gaudí experience. "We have to lift Gaudí off the postcards," says Daniel Giralt-Miracle, the art critic who directs the government team that organized the celebration. "We must go on to really see Gaudí, to know and understand him. That is the big objective of the Gaudí year."

In line with this, museums and other institutions have mounted some 50

BARCELONA, GAUDI AND MODERNISM, LOFT PUBLICATIONS (BARCELONA, SPAIN), 2001; PP. 58, 59 TINO SORIANO; P. 61 TINO SORIANO; MELBA LEVICK/WOODFIN CAMP & ASSOCIATES



exhibitions to explain Gaudí's architectural techniques, showcase his furniture and interior design, and describe his era. Government-sponsored buses shuttle tourists among the main Gaudí sites and exhibitions. And the doors of some buildings, like the dramatic Casa Batlló, an imposing residence two blocks down the boulevard from La Pedrera, have been opened to the public for the first time.

As I learned, Gaudí is not easy. Both his art and personality are complex. To start with, he was obsessed with nature and geometry. Nature, he insisted, was "the Great Book, always open, that we should force ourselves to read." He embellished his edifices with replicas of soaring trees, multicolored lizards and fossilized bones, and he fitted his structures with architectural paraboloids and other intricate geometric forms. He didn't like to work from architectural plans, for he found his visions hard to put down on paper. Then, too, he often changed his designs as his buildings came alive.

His manner was brusque and sometimes overbearing. He made it clear to others that he never doubted his creative genius. He did not like assistants to question his work. "The man in charge should never enter into discussions," he once said, "because he loses authority by debate." Rafael Puget, a contemporary of Gaudí's who knew him well, described the architect as a man with "a morbid, insoluble pride and vanity" who acted "as though architecture itself had begun at the precise moment when he made his appearance on earth." He grew intensely religious

Gaudí conceived the Casa Milà (left) as a giant sculpture as well as a functional 24-unit apartment building. A supporting steel substructure enabled him to construct the free-form, undulating stone facade. The whimsical shapes of the chimneys and vents (top) create a fairyland roofscape.

"Color in architecture must be intense, logical and fertile," Gaudí wrote in the late 1870s. He enlivened the facade of his Casa Batlló (above, left) with scalelike roof tiles meant to evoke a dragon's back, multihued mosaics and (above, right) stained-glass windows.

as he aged, and he devoted the last decade of his life to construction of the hugely ambitious Sagrada Família. But critics charged that he was driven more by his ego than his devotion to God.

ANTONI GAUDÍ I CORNET WAS BORN June 25, 1852, in the small Catalan town of Reus, 75 miles southwest of Barcelona. He came from a long line of artisans; his father, grandfather and great-grandfather were all coppersmiths. He learned the elementary skills of the copper craft as a youngster, then left for Barcelona in 1868 at age 16 to complete his secondary education and enroll in the school of architecture at the university there.

His early coppersmith training may account for his enthusiasm for the nitty-gritty of building. He would become a hands-on architect, working alongside his craftsmen. When La Pedrera was being built, for example, he stood in the street and personally supervised the placement of the stone slabs of the facade, ordering the masons to make adjustments until he found the proper place for each slab.

His student work did not please all of his professors. While working part-time in architectural studios, he often skipped classes and made it clear to students and teachers alike that he did not think much of architectural education. In his view, it was mere discipline, bereft of creativity. The faculty vote to pass him was close, and at his graduation in 1878, the director of the school announced, "Gentlemen, we are here today either in the presence of a genius or a madman."

Judging by photographs, Gaudí was a handsome young man with penetrating blue eyes, reddish hair and a thick beard. He wore well-cut, fashionable suits, attended opera at the famous Liceo theater and enjoyed dining out.

Gaudí was the youngest of five children, and all the others died before him, two in childhood, two as young adults. He lost his mother in 1876, when he was 24, just two months after the death of his brother, Francesc, a medical student. His sister Rosa died three years later, leaving a child, Rosita, whom Gaudí and his father brought up. Tubercular and alcoholic, she, too, died as a young adult.

Gaudí never married. While designing housing for a workers' cooperative early in his career, he fell in love with Pepeta Moreu, a divorced schoolteacher and rare beauty who demonstrated her independence by swimming in public, reading republican newspapers and associating with socialists and anti-monarchists. Gaudí asked her to marry him, but she turned him down. Biographers mention a possible interest in two or three other women during his lifetime but offer no details. His niece, Rosita, however, was definitive. "He didn't have a girlfriend or amorous relations," she once said. "He didn't even look at women."

THE BARCELONA OF THE 1880S WAS AN exciting place for a young architect. The city was expanding rapidly, with new homes and offices to be built. Rich bourgeoisie were able to spend lavishly on construction. They wanted to look modern and trendsetting and were open to new artistic fashions. Three architects would benefit most from this patronage: Lluís Domènech i Montaner, who was three years older than Gaudí, Josep Puig i Cadafalch, who was 15 years younger, and, of course, Gaudí himself.

The course of Gaudí's career was set when, at age 26, he met Eusebi Güell, a wealthy industrialist, politician and future count. Only five years older than Gaudí, Güell asked him in 1883 to de-

PATRICK WARD; TINO SORIANO; P. 63 ROBERT FRERCK/WOODFIN CAMP & ASSOCIATES

sign a gate, stables, hunting pavilion and other small structures for his family's estate on the periphery of Barcelona. For the next 35 years, the rest of Güell's life, he employed Gaudí as his personal architect, commissioning a host of projects, from mundane laundry facilities to the elegant and stately Palau Güell, his mansion just off La Rambla, the mile-long esplanade that runs through the heart of the old city. At his patron's behest, Gaudí even designed a crypt. For it, he devised an ingenious system of inverted modeling for calculating loads on columns, arches and vaults using strings, from which he hung bags of bird shot as weights.

Güell was a munificent patron. While Gaudí was building the Palau in the late 1880s, the skyrocketing construction costs alarmed one of the industrialist's secretaries, a poet named Ramón Picó Campamar. "I fill Don Eusebi's pockets and Gaudí then empties them," Picó complained. Later, he showed a pile of bills to his employer. After looking them over, Güell shrugged. "Is *that* all he spent?" he said.

In 1883, the year he started to work for Güell, Gaudí won a contract to take over as architect of the Expiatory Temple of the Holy Family, the Sagrada Família. The project was supported by a group of conservative Catholics who wanted a holy edifice where sinners could atone for succumbing to modern temptations.

Although Gaudí had not been especially devout as a young man, construction of the Sagrada Família deepened his faith. The Lenten fast he went on in 1894 was so strict it almost killed him. Father Josep Torras, spiritual adviser to the Artistic Circle of Saint Luke, an organization of Catholic artists

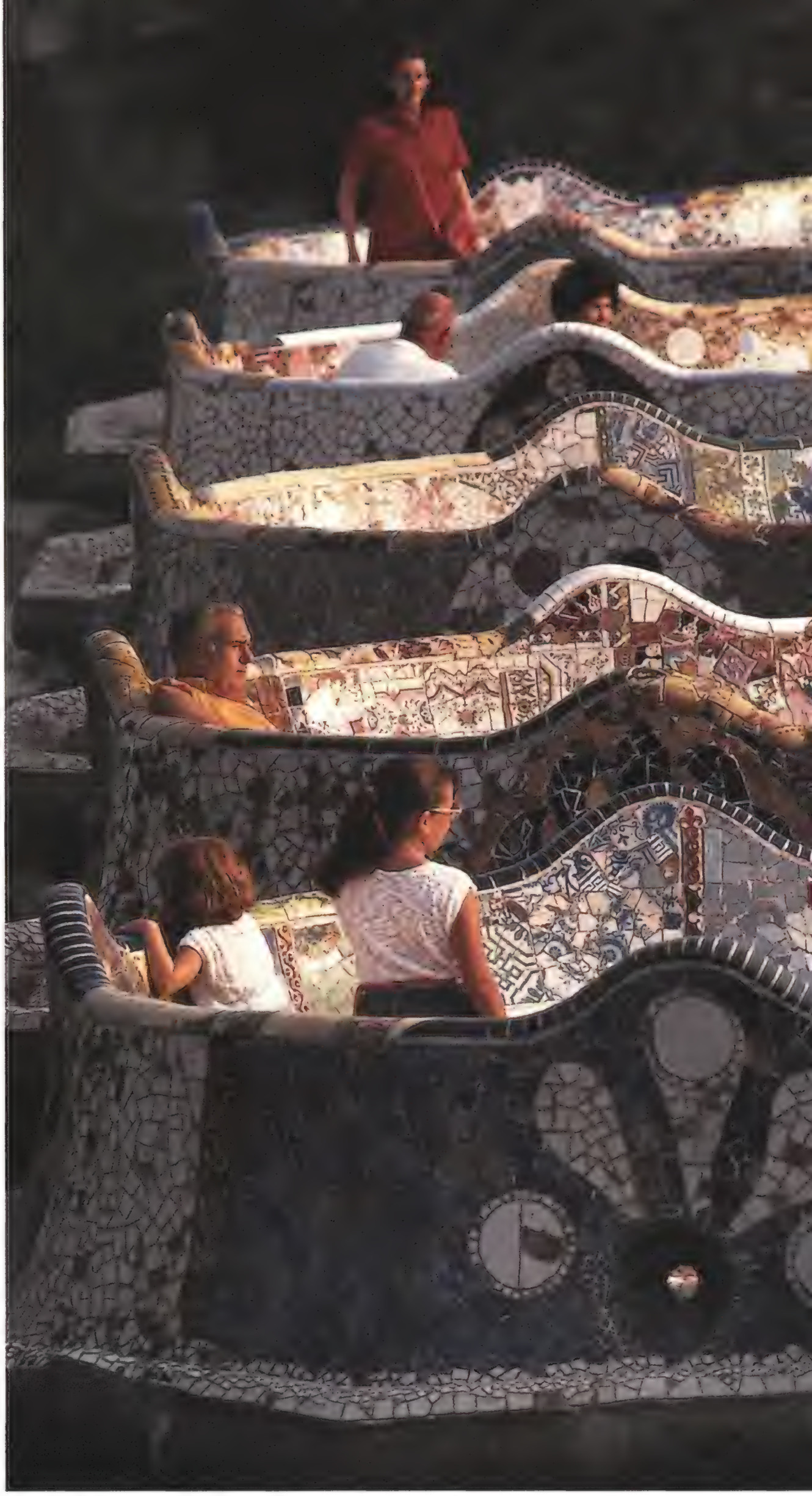
Intended as a tribute to St. George, the patron saint of Catalonia, and his slaying of the mythical dragon, the Casa Batlló suggests skulls and bones as well as scales.

to which Gaudí belonged, had to talk him into breaking it.

At the turn of the 20th century, fervent religious belief often went hand in hand with intense Catalan nationalism. Chafing at domination by Madrid, Catalans began to dwell on their history as an independent Mediterranean power. This led to a revival of Catalan cultural traditions, a determination to use the Catalan language and demands for political autonomy. Though a committed Catalan nationalist, Gaudí did not take part in politics. Still, when Alfonso XIII, the Spanish king, visited the site of the Sagrada Família, Gaudí would speak to him only in Catalan. Years later, police stopped the 72-year-old architect as he tried to attend a prohibited Mass for 18th-century Catalan martyrs. When the police demanded that he address them in Castilian Spanish, the official language, he retorted, "My profession obliges me to pay my taxes, and I pay them, but not to stop speaking my own language." Gaudí was thrown in a cell and released only after a priest paid his fine.

Gaudí's work, like that of Domènech and Puig, owed much to the ornamental Art Nouveau style emerging in other European cities. In addition to twisting curves and structures that imitated natural forms, he favored Arabic and Oriental designs and symbols that encouraged nationalist feelings. If you look at the ironwork and furniture designed by Gaudí and that of the French Art Nouveau architect Hector Guimard, it is hard to tell them apart. Yet Gaudí did not regard himself as a disciple of modernismo, and considered the artists who gathered evenings at Els Quatre Gats (a café designed by Puig) to discuss their work as too libertine. He preferred the company of fellow members of the conservative and religious Artistic Circle of Saint Luke.

Much of Gaudí's early architecture, including the Palau Güell, strikes me as dense and dark—though lightened by



To make sure visitors to the Park Güell would have comfortable seating, Gaudí made one of his workmen sit in plaster to create a mold for the park's tile-encrusted serpentine bench.

novel touches. Reviving an old technique of the Arabs of Spain, he sheathed the palace's 20 chimneys with fragments of ceramics and glass. Under his direction, workmen would smash tiles, bottles and dishes and then fit the pieces into bright, abstract patterns. He apparently even smashed up one of Güell's Limoges dinner sets. For Gaudí, the myriad colors resulting from this technique, known as *trencadís*, reflected the natural world. "Nature does not present us with any object in monochrome . . . not in vegetation, not in geology, not in topography, not in the animal kingdom," he wrote in his 20s. Trencadís became a Gaudí trademark.

One project, the Park Güell, is a paradise of trencadís. At the turn of the 20th century, Güell decided to create a suburban garden city on a hill overlooking Barcelona. The project never fully materialized; only two homes were built, including one that Gaudí moved into with his father and niece. But the architect completed most of the public works for the aborted garden city and brightened them with fragmented tile. With its mushroomlike spires, grand serpentine bench, fanciful fountain, impish air and vistas of the city, the Park Güell remains a popular place to take children on weekends.

Gaudí created several buildings elsewhere in Spain, and there were stories that he once drew up plans for a hotel in New York. But his greatest work was largely confined to Barcelona and its suburbs. Three buildings there, all works of his maturity—the Casa Batlló, La Pedrera and the Sagrada Família—illustrate the essence of his architecture. When American architect Louis Sullivan saw photographs of the Sagrada Família, he described it as "the greatest work of all creative architecture in the last 25 years." Gaudí conceived his buildings as works of art. He intended La Pedrera, for example, to serve not only as an apartment building but also as the pedestal for an immense statue of the Virgin Mary, until the owner balked. So Gaudí turned the entire edifice into a monumental sculpture. (After decades of functional, nondecorative design, Gaudí's architecture-as-art approach is back in vogue, carried out by such contemporary architects as deconstructivists Frank Gehry and Daniel Libeskind. As high-tech architect Norman Foster put it a few years ago, "Gaudí's methods, one century on, continue to be revolutionary.")

Flamboyant painter Salvador Dalí (on a Park Güell bench) admired Gaudí's work.

COMPLETED IN 1906, CASA BATLLÓ WAS Gaudí's reconstruction of an apartment building on a block that already had works by Domènech and Puig. Although all three structures are outstanding examples of modernismo, the street is sometimes called "The Block of Discord" because it displays rival efforts. Gaudí stretched fantasy far more than the others, with a facade of odd-shaped windows separated by columns that resemble petrified bones.

The success of Casa Batlló prompted wealthy developers Pere and Roser Milà to commission Gaudí to build a luxury apartment house just a few blocks away. Gaudí's Casa Milà, or, as it became known, La Pedrera, the Stone Quarry, is an enormous building with honey-colored limestone slabs curving across the facade, sculpted balconies railed in thick cast-iron vegetation, and a rooftop guarded by strange, warriorlike chimneys and vents.

Though it has long been hailed as an Art Nouveau masterpiece, La Pedrera provoked ridicule when first completed in 1910. Cartoonists portrayed it as a garage for dirigibles, a war machine with cannon protruding from every window and a warren of caves infested with animals. Painter Santiago Rusinyol joked that the only pet a tenant could possibly keep there was a snake. There was also some praise: critic Ramiro de Maeztu, for instance, wrote in the newspaper *Nuevo Mundo* that "the man's talent is so dazzling that even the blind would recognize Gaudí's work by touching it." But, all in all, Barcelona, like cities elsewhere in Europe, was losing its taste for Art Nouveau architecture.

Gaudí, who was 58 when La Pedrera was completed, would not receive another major private commission from anyone but Güell for the rest of his life. Turning his attention to the Sagrada Família, he designed for it crusty stone and ceramic spires that soar like primeval trees. He planned two grand portals with sculpture as elaborate as any of that in the great Gothic cathedrals of Europe.

But donations for the church dwin-

A giant *trencadís* lizard adds to the playful spirit of Park Güell, built in 1900-1914.

F. CATALA-ROCA/FUNDACIÓ GALA-SALVADOR DALÍ; TINO SORIANO; P. 64 ROBERT FRERCK/WOODFIN CAMP & ASSOCIATES

The ornate dining room of the Palau Güell (1885-89) reflects Gaudí's love of fine craftsmanship and elaborate decorative detail.

Gaudí took great pains with the facade of the Güell mansion, even incorporating his patron's initials in the iron entrance gates.

dled in the early 20th century, as Barcelona's citizens became disenchanted with the radical conservatism espoused by the Sagrada Família's main backers. Gaudí sold his house in order to raise money for the project and solicited others for funds, even going so far as begging in the streets. His father died in 1906, his niece in 1912, leaving him with no immediate family. His spiritual adviser, Bishop Torras, and his patron, Güell, died a few years later. "My best friends are all dead," Gaudí, then 64, said after Güell's death in 1918. "I have no family, no clients, no fortune, nothing." But he was not despairing. "Now I can devote myself entirely to the temple," he declared.

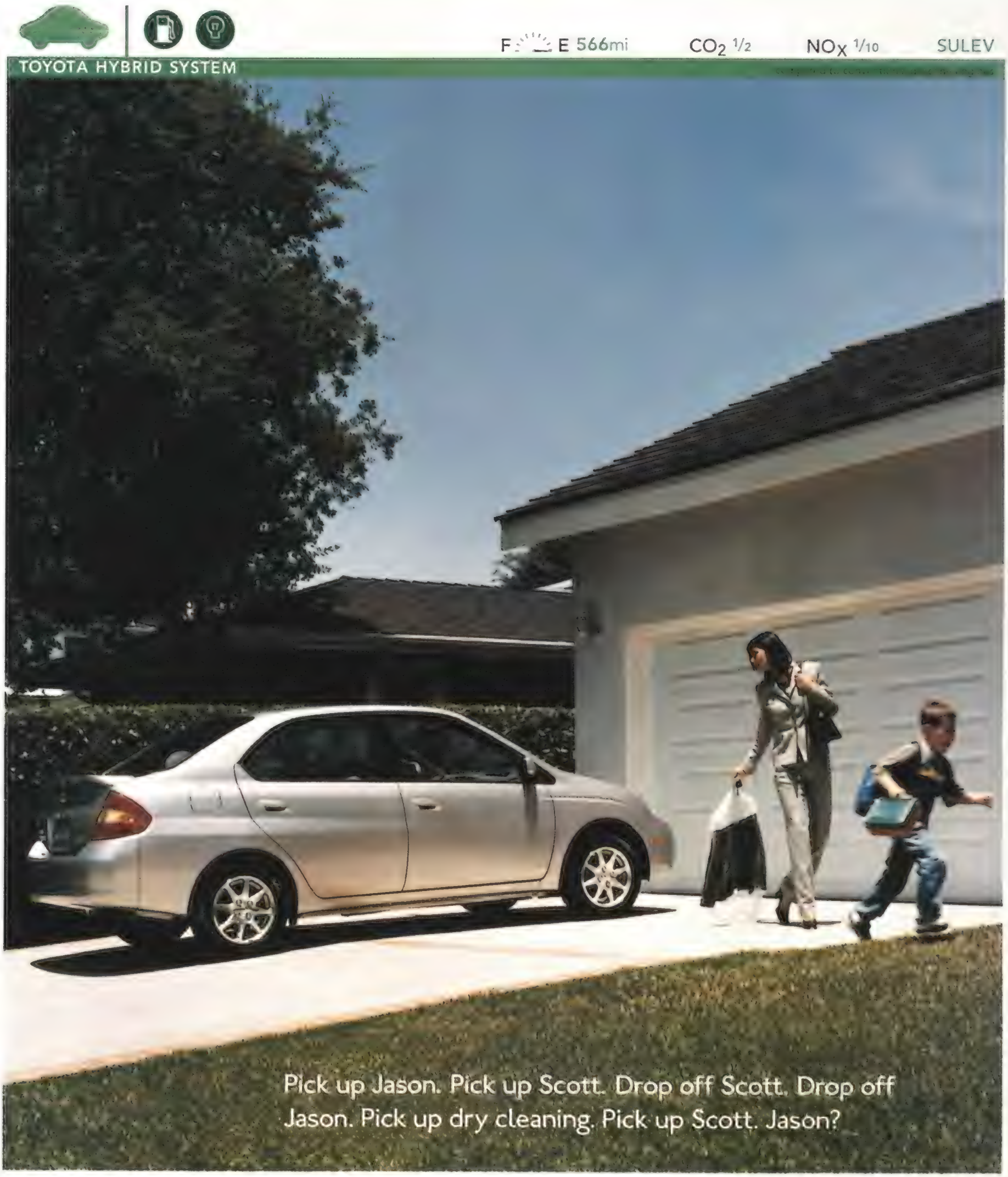
By now he was nearly bald, his beard was white and he appeared too thin for his unkempt, soiled clothes. He wore bandages on his legs to ease arthritic pain, walked with a stick and laced his shoes with elastic. He lunched on lettuce leaves, milk and nuts, and munched on oranges and bread crusts he kept in his pockets. In 1925 he moved into a small room alongside his studio workshop in the Sagrada Família so he could be closer to his all-consuming project.

ON JUNE 7, 1926, CROSSING THE GRAN Via boulevard, Antoni Gaudí looked neither right nor left, ignored warning shouts and the clanging bell of an onrushing trolley, and crumpled as it struck him down. He had no identification and looked so disreputable he was taken to the public ward of a Barcelona hospital. When he was identified a day later, he refused suggestions that he move to a private clinic. "My place is here, among the poor," he reportedly said. He died a couple of days later, just two weeks shy of his 74th birthday, and was buried in the crypt of the Sagrada Família.

Work on the church continued sporadically after his death. By the time the outbreak of the Spanish Civil War halted construction in 1936, four spires stood in place. Catalan republicans, angered by the Catholic church's support of fascist rebel leader Generalissimo Francisco Franco, ravaged the churches of Barcelona. They sacked Gaudí's old office in the Sagrada Família and destroyed his drawings, but left the structure intact. British writer George Orwell, who fought with the anti-Franco forces, called it "one of the most hideous buildings in the world." The leftists, he contended, "showed bad taste in not blowing it up when they had the chance."

Although Gaudí's admirers included the likes of Catalan Surrealist painter Salvador Dalí, the 100th anniversary of his birth passed in 1952 without elaborate commemorations. Praise from the eccentric Dalí, in fact, only made Gaudí

ADAM WOOLFITT/CORBIS; PATRICK WARD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Gaudí's most ambitious and controversial project, the boldly innovative, unfinished Sagrada Família church, has become a beacon for tourists and a symbol of Barcelona.

seem outlandish and isolated—a strange hermit who relied on wild dreams for inspiration. But Gaudí, as *Time* art critic Robert Hughes wrote in his book *Barcelona*, did not believe "his work had the smallest connection with dreams. It was based on structural laws, craft traditions, deep experience of nature, piety, and sacrifice." Thoughtful interest in Gaudí has swelled over the past few decades as Spanish critics, like critics elsewhere, began to look more closely at neglected works from the Art Nouveau era.

In 1986, a Barcelona-based savings bank, the Caixa Catalunya, purchased La Pedrera. The structure, which along with Gaudí's Palau Güell and Park Güell was declared a UNESCO World Heritage Site in 1984, was in woeful disrepair, but a foundation formed by the bank meticulously restored it and opened parts of it to the public in 1996. Foundation director J. L. Giménez Frontín says, "We had to look for the same earth to make the same bricks."

The bank allows visitors access to the roof and two permanent exhibitions. One traces Gaudí's life and work; the second presents an apartment as it might have been furnished at the turn of the century. In honor of International Gaudí Year, a special exhibition, "Gaudí: Art and Design," featuring furniture, doors, windows, doorknobs and other decorative elements designed by the architect, is on view through September 23.

In the early 1980s, work resumed in earnest on the Sagrada Família. The nave is scheduled to be ready for worship by 2007, but the full church, with a dozen spires, may take until mid-century to complete. Critics complain that contemporary artists, operating without Gaudí's plans and drawings, are producing ugly and incompatible work. Robert Hughes calls the post-Gaudí construction and decoration "rampant kitsch."

FOR ITS PART, THE CATHOLIC CHURCH wants to make Gaudí a saint. The Vatican authorized the start of the beatification process in 2000 after Cardinal Ricard Maria Carles of Barcelona requested it, proclaiming that Gaudí could not have created his architecture "without a profound and habitual contemplation of the mysteries of the faith." But that, contend some critics, is going too far. Says professor of communications Miquel de Moragas: "We think of him as Gaudí the engineer, Gaudí the architect, Gaudí the artist, not Gaudí the saint."

But whether Gaudí is a saint or not, there is no doubt about the power of his architecture to excite wonder and awe. As Joaquim Torres-García, an artist who worked at the same time as Gaudí, put it, "It is impossible to deny that he was an extraordinary man, a real creative genius. . . . He belonged to a race of human beings from another time for whom the awareness of higher order was placed above the materiality of life."

Author Stanley Meisler covered Spain for the Los Angeles Times in the 1970s and '80s.

PATRICK WARD

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Against All Odds

A NEW PLAY AND PHOTO EXHIBITION CALL ATTENTION TO IDA B. WELLS AND HER BRAVE FIGHT TO END LYNCHING IN AMERICA

BY CLARISSA MYRICK-HARRIS

Wells (in photograph, comforting Betty Moss, seated, and her children after the vigilante murder of Moss' husband) has been all but overlooked by history.

ONE SEPTEMBER DAY IN 1883, IDA B. WELLS STEPPED aboard a train in Memphis. She was 21 and a public school teacher. After she took a seat and opened a book to read, a conductor demanded that she move to a car designated for black passengers. She refused.

When the conductor grabbed her arm, Wells bit his hand. Hard. "I had braced my feet against the seat in front and was holding to the back," she would later recall. "As he had already been badly bitten, he didn't try it again by himself." Though she was no more than about five feet tall, it took three men to roust her from the seat. Still, she refused to sit in the other car and got off the train at the next stop.

Wells sued the Chesapeake, Ohio, and Southwestern Railroad in 1884 for violating equal accommodation statutes—and, incredibly, won. But the Tennessee Supreme Court overturned the verdict in a ruling that would lay the groundwork for the "separate but equal" doctrine that kept racial segregation in place for decades.

Her ordeal, with its intriguing parallels to Rosa Parks' civil disobedience aboard a bus in Montgomery, Alabama, 72 years later, not only reveals Wells' fierce will but also essentially launched her lifelong, often dangerous struggle to secure the rights of African-Americans.

This fearless woman would do more than anyone to curtail the terrorizing of blacks by lynch mobs. She would also publish a newspaper, help found a number of African-American self-help organizations—including the National Association for the Advancement of Colored People (NAACP)—advance women's rights and run for the Illinois Senate. Although she pioneered tactics that would become crucial to the civil rights movement decades later, she is not nearly as well known as contemporaries Frederick Douglass, Booker T. Washington and W.E.B. Du Bois. But that is changing.

A traveling exhibition of photographs of lynching victims—profoundly disturbing images that have torn at old wounds and stirred controversy—has called attention to the wave of atrocities that Wells risked her life to stop. Joseph Jordan, curator of the exhibition *Without Sanctuary: Lynching Photography in America*, on view in Atlanta through December, says Wells "stands apart as the most recognizable and effective antilynching crusader in history."

A new play that sketches and celebrates Wells' life, *Constant Star*, has been staged in several cities, including Washington, D.C., Hartford and, last month, Pittsburgh. (It goes to Palm Beach, Florida, next March.) Playwright Tazewell Thompson says he was moved to investigate the "insane lawlessness" of lynchings and to write about Wells' crusade against them after viewing a 1989 documentary, *Ida B. Wells: A*

"If I could take one lyncher with me," Wells once said, "this would even up the score a little bit."

Passion for Justice. "It haunted me that this tiny woman had to become the drum majorette for this campaign," says Thompson, a theater director. "Wells believed it was a land of laws, and by God she was going to see to it that everyone was treated as if 'all men are created equal.'"

And a Wells biography scheduled for publication next year is expected to shine more light on Wells' uncompromising vision, which rankled some civil rights figures and partly accounts for why, until recently, she has not received the recognition her achievements warrant. "She did not hold her tongue at all. And she didn't like to follow," says the book's author, Paula J. Giddings, a professor of Afro-American Studies at Smith College in Massachusetts. No less important, Wells has received only limited attention in academia, where the reputations of most historical figures are formed. "Black women tend to be marginalized both in Afro-American studies and in women's studies," Giddings adds.

AFTER SLAVERY ENDED IN THE UNITED STATES IN 1865, Southern states enacted several Jim Crow laws denying equality to African-Americans. White supremacist groups such as the Ku Klux Klan terrorized black citizens. Racist ideology dressed up as "science" depicted blacks as lascivious and inferior. It was in this charged atmosphere that some of the most heinous crimes ever committed in this country were sanctioned by the white community at large, and even by law officials themselves.

Lynching—the kidnapping, torturing and killing of men, women and children by vigilante mobs—became commonplace. Between 1880 and 1930, approximately 3,220 black Americans were reported lynched, along with perhaps 723 whites. The 1880s ushered in a dramatic and prolonged rise in the percentage of African-American victims. These lawless executions, blind to any constitutional guarantee of due process, often attracted large crowds. Some spectators brought along children and even picnic baskets, as though the horrific murder of another human being constituted entertainment, or worse, edification. It was the brutal lynching of a friend in 1892 that rallied Wells, then 29, to the antilynching cause.

By then, Wells had become a full-time journalist. When a series of articles she had written about her court case against the railroad was picked up by African-American newspapers across the country (and eventually led to a column), Wells knew what she wanted to do with her life. She bought part-ownership in the *Free Speech*, a black Memphis newspaper, and became its coeditor. "She has plenty of nerve, and is as sharp as a steel trap," said T. Thomas Fortune, editor of the *New York Age*, a leading black newspaper.

One of her closest friends was Thomas Moss, who owned a grocery store in Memphis with two other black men. A white businessman, angered by competition from the new store, had pressured town officials to close it down. When a scuffle broke out between black and white youths near the black-owned store, he and other white residents threatened to destroy it. After a group of white men marching toward the store at night were fired upon and at least one was wounded, police rounded up and jailed more than a hundred blacks. But Moss and his two partners were "carried a mile north of the city limits and horribly shot to death," Wells wrote in *Free Speech*. A local white newspaper reported Moss' last words: "Tell my people to go West—there is no justice for them here."

The murders devastated Wells, who was godmother to the Mosses' daughter. "The city of Memphis has demonstrated that neither character nor

Thousands gathered in Paris, Texas, for the 1893 lynching of Henry Smith.

BETTMANN/CORBIS; P. 70 DAVID J. & JANICE L. FRENT COLLECTION/CORBIS; P. 71 UNIVERSITY OF CHICAGO LIBRARY

Wells rallied overseas support (British NAACP members, above, picket in London in the early 1900s) and boycotted racist businesses.

standing avails the Negro if he dares to protect himself against the white man or become his rival," she wrote in an editorial. Echoing Moss' last words, Wells and other black leaders encouraged black Memphians to leave the city, which, she said "will neither protect our lives and property, nor give us a fair trial in the courts, but takes us out and murders us in cold blood."

Thousands of blacks joined the "Exodusters" migrating to Oklahoma and other points west. Wells urged those who remained to boycott streetcars and white businesses. Railway officials, assuming that black passengers were staying away out of a mistaken belief that the electric cars were hazardous, pleaded with Wells to tell her followers the cars were safe. "Keep up the good work," she told her readers.

Driven by anger and grief, Wells plunged into a wide-ranging investigation of lynching in America, documenting the circumstances of more than 700 incidents over the previous decade. She traveled alone across the South to the spots where lynching parties had shot, hanged and burned victims, taking sworn statements from witnesses, scrutinizing records and local newspaper accounts, sometimes hiring private investigators. She studied photographs of mutilated bodies hanging from tree limbs and of lynchers picking over the bones and ashes of burned corpses.

Her findings would astonish many Americans, appall others and outrage white supremacists. She aroused the strongest ire by venturing into the taboo realm of sexuality. The excuse frequently used for the lynching of black men was that they had raped white women. But her research showed that rape had never been alleged in two-thirds of the lynchings, and when it was, the "rape" was often alleged after a secret relationship was discovered or following nothing more than a suggestive look. In one editorial, Wells dared suggest that many of the white women had had consensual sex with the men.

Wells was en route to New York when white newspapers reprinted the editorial. Vandals ransacked the *Free Speech* offices, and fearing for his life, her coeditor fled the city. Racist whites promised to lynch Wells if she returned. A Memphis paper, the *Evening Scimitar*, threatened the editorial's author, whom the paper believed to be a man. "Tie the wretch who utters these calumnies to a stake . . . brand him on the forehead with a hot iron, and perform upon him a surgical operation with a pair of tailor's shears." Wells, who had armed herself with a pistol after Moss' lynching, vowed to die fighting. "I had already determined to sell my life as dearly as possible if attacked," she would later write. "If I could take one lyncher with me, this would even up the score a little bit."

T. Thomas Fortune met with Wells during her trip and convinced her to remain in New York City. There she parlayed the subscription list of the now-defunct *Free*

CORBIS

"She was responsible for the first antilynching campaign in the United States," says Giddings.

Speech into part-ownership of the *New York Age*, which published the findings of her investigations. She also published a pamphlet, *Southern Horrors: Lynching in All Its Phases*, for which renowned abolitionist Frederick Douglass, then in his 70s, penned the preface. "Brave Woman!" he wrote, "If American conscience were only half alive . . . a scream of horror, shame and indignation would rise to Heaven wherever your pamphlet shall be read."

Her crusade gaining momentum, Wells toured Great Britain in 1893 and 1894, speaking in packed churches and lecture halls. The "sweet-faced" orator spoke with "singular refinement, dignity and self-restraint," wrote a London observer. "Nor have I ever met any agitator so cautious and unimpassioned in speech. But by this marvelous self-restraint itself, she moved us all the more profoundly."

She so impressed the Duke of Argyll, Sir John Gorst, that he became the founding president of the London Anti-Lynching Committee, the first of many such chapters in Great Britain and the United States. The London membership included the archbishop of Canterbury, members of Parliament and the editors of England's most prestigious papers. On a dare by Southern papers in the United States and to get at the truth about lynching in America, Sir John and his committee visited the United States in the summer of 1894. The mere presence of the British visitors, who threatened a boycott of U.S. goods, infuriated white Americans. Governor John Altgeld of Illinois said Southerners should retaliate by visiting Ireland "to stop the outrages there."

As it happened, the British delegation was touring the States when a lynching party killed six black men near Memphis. "If Ida B. Wells had desired anything to substantiate the charges against the south," noted an Ohio newspaper, "nothing more serviceable could have come to hand." That incident marked a sort of turning point. Even the *Evening Scimitar*, which had called for lynching Wells herself two years before, now sounded contrite. "Everyone of us is touched with blood guiltiness in this matter," the paper editorialized.

Historian Philip Dray, author of *At the Hands of Persons Unknown*, a history of lynching in America, says Wells' work effected a deep change in racial thinking. "In an age when blacks were written about almost exclusively as a problem," he says, "she had established lynching as a practice in which whites were the problem and blacks those in need of compassion and justice."

One tactic that made Wells effective, says historian Paula Giddings, was that she persuaded Northern and foreign investors that lynchings were a form of anarchy, which was poison for economic development. This view threatened investments earmarked for the South. Her calls for boycotts in the South by the black labor force caused states that previously ignored lynchings to rethink their complacency.

Following Wells' campaign, the number of lynchings went down, from a peak of 235 in 1892, to 107 by 1899, and antilynching legislation was enacted in parts of the South. "She was responsible for the first antilynching campaign in the United States," says Giddings. "And she started it almost single-handedly."

"What a wonderful place in the scheme of things the Creator has given women," Wells said after the birth of son Charles in 1896.

WELLS WAS BORN A SLAVE IN HOLLY SPRINGS, MISSISsippi, in the midst of the Civil War in July 1862. The child's first three years were punctuated by the sound of gunfire and the frenzy of minor skirmishes, according to Wells biographer Linda McMurry in *To Keep the Waters Troubled*, published in 1998. The town was captured and recaptured by opposing armies throughout the conflict, changing hands at least 59 times, writes McMurry.

Wells' father, Jim, was the son of an enslaved woman named Peggy and her white owner. More privileged than some slaves, Jim was apprenticed out to learn carpentry.

UNIVERSITY OF CHICAGO LIBRARY (2)

In 1917 Wells, her husband Ferdinand (both seated), and family bade farewell to Ferdinand, Jr. (in uniform), who served in Europe.

After the war, he worked as a paid employee for the carpenter who had taught him, but lost his job when he refused to vote for the Democratic ticket of white supremacy. In a display of the grit that he evidently passed on to his daughter, he opened his own business across the street from his former employer. Ida Wells' mother, Elizabeth, was a cook, an "outspoken woman who was constantly whipped and beaten as a slave," says playwright Thompson. The reason she wasn't killed outright, he avers, is that "she was known as the finest cook in the South."

Ida Wells' fearlessness, says Giddings, came in part from her father, a leader of the local black community who attended political meetings in spite of an ever-present threat of terrorism by the Ku Klux Klan. Mississippi's Secretary of State during Reconstruction, James Hill, was a family friend. In due course Holly Springs became home to one of two blacks in the state senate.

Ida's forceful personality emerged at a young age. She was expelled from school after a confrontation with the institution's president. It isn't known what the fight was about, but as McMurry notes, "Ida's fiery temper often got her into trouble." The greatest crisis of her young life occurred when a yellow fever epidemic struck Holly Springs in 1878 and killed both of her parents and her baby brother. Family friends arranged to place her five surviving brothers and sisters in homes around the county, but 16-year-old Ida vetoed the plan. She lengthened her skirts (to look older) and got a job as a country schoolteacher, supporting her siblings on a salary of $25 a month.

In 1881, she accepted a better-paying teaching position in Woodstock, Tennessee, even as she dreamed of a more exciting career as a "journalist, physician or actress." She studied elocution and drama at Fisk University in Nashville—training that must have proved helpful when she later took to the lecture circuit.

She was 32 and already a noted journalist and activist when she married in 1895. Frederick Douglass had recruited Wells and Ferdinand Lee Barnett, a prosperous black attor-

"Since you got married," Susan B. Anthony chided Wells, "agitation seems practically to have ceased."

ney and publisher of *The Conservator* newspaper in Chicago, to help write a pamphlet protesting the exclusion of black participants from the 1893 World's Fair in Chicago.

Barnett, as militant as Wells, was once jailed for telling an audience that America was a "dirty rag" if it didn't protect all of its citizens. A widower with two sons, Barnett soon proposed to Wells, who eventually agreed to marry him.

She persuaded Barnett, who was busy with his legal work, to sell *The Conservator* to her. Journalism, she later wrote in her autobiography, "was my first, and might be said, my only love." A few days after the wedding, Wells took charge of the newspaper.

Typically ahead of her time, the new bride adopted a hyphenated last name, Wells-Barnett. The couple had two daughters and two sons. For Wells, as for many career women, balancing work and family was a challenge. Her friend, suffrage leader (and spinster) Susan B. Anthony, chided Wells that "since you have gotten married, agitation seems practically to have ceased."

But while Wells struggled daily with a sense of divided duty, she still managed to speak at antilynching rallies and at women's club conventions, even while nursing. In 1898, baby Herman went along on his mother's five-week trip to Washington, where she discussed lynchings with President William McKinley and also lobbied Congress—unsuccessfully—for a national antilynching law.

Wells (on a 1990 stamp) was controversial in her day but is now gaining acceptance.

ALTHOUGH WELLS WAS PROBABLY the most prominent black female journalist and activist of her era, she did not succeed Frederick Douglass as the acknowledged leader of the African-American community after the "grand old man" died in 1895. Today's scholars speculate why that was so. Giddings thinks it was due mainly to her gender. Also, she spoke openly about sexuality and murder—issues deemed unbecoming of a lady in the Victorian era. For African-American women at the turn of the century, writes Patricia Schechter in *Ida B. Wells-Barnett and American Reform, 1880-1930* progressive reform "favored professional experts, well-funded national organizations, and men."

And there's no question that Wells' militancy and fiery temperament worked against her. She was unusually fierce and uncompromising in her devotion to her ideals and she clashed with contemporaries along ideological lines. "Wells stayed militant at a time when other leaders believed a moderate relationship with the power structure was the most effective way of doing things," says Giddings.

The person who had emerged to lead black America at the turn of the 20th century was Booker T. Washington, the head of the Tuskegee Institute. He not only urged blacks to improve their lives through blue-collar labor but also proposed a compromise that would leave Southern blacks segregated and disenfranchised. Wells criticized Washington's accommodation policy, says Dorothy Sterling in *Black Foremothers: Three Lives*. She lacerated him for urging blacks "to be first-class people in a Jim Crow car" rather than "insisting that the Jim Crow car be abolished." And when several blacks were killed by white rioters in North Carolina (following the murder of a black postmaster and his infant son in South Carolina), Wells charged McKinley with indifference and inaction. "We must do something for ourselves, and do it now," she advocated. "We must educate the white people out of their 250 years of slave history." Labeled a hothead by both Washington and McKinley supporters, Wells found herself spurned by the very organizations she had helped create.

In 1909, black and white organizers met in New York to choose a "Committee of Forty" to shape the agenda for the emerging NAACP. When they voted down Wells' motion to make lobbying for an antilynching law a priority, she walked out. Fellow black activist W.E.B. Du Bois, who thought Wells too radical and outspoken, scratched her name from the committee. Wells was reinstated only after her supporters protested. But she would never have an easy relationship with the NAACP. When its magazine, *The Crisis*, published an article in 1912 about the people who campaigned against lynching, Wells was not even mentioned.

Yet she was never down for long. In 1910, she had established the Negro Fellowship League to assist poor black migrants streaming into Chicago from the rural South. She served as the first black female probation officer in Chicago. In 1913, she organized what was likely the first suffrage organization for black women in America. She helped the Brotherhood of Sleeping Car Porters, a key labor union,

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Five different actresses depict Wells in *Constant Star* (in Washington, D.C., spring 2001, before it toured several other U.S. cities).

gain a foothold in Chicago. And she inspired black women across the country to organize—a movement that gave rise to the National Association of Colored Women.

At least twice Wells tried to retire from public life, only to have new injustices lure her back into the fray. At 59, she traveled from Chicago to Little Rock, Arkansas, to investigate the case of 12 black men on death row. The men, sharecroppers who had organized a union, were convicted for conspiring to kill whites and steal their land. After the inmates told Wells that they had been tortured, she published a pamphlet that described their plight and distributed it throughout the state. Officials later pardoned and freed all 12 prisoners.

At 67, saying she was tired of the "do-nothings" in politics, she ran for the Illinois state senate. She finished last but vowed to learn from the mistakes of the campaign.

She devoted much of her remaining energy to an autobiography. "Our youth are entitled to the facts of race history which only the participants can give," she wrote in the preface. She stopped writing mid-sentence in what would be the last chapter of her book. After a day of shopping, she complained of feeling ill. Two days later, she lapsed into a coma; she died of kidney disease on March 25, 1931.

Today, Wells is remembered as a social pioneer, a woman of many firsts—in journalism and civil rights. But she's best known for her courageous and often lonely battle against the scourge of lynching. "She had a vision of how to execute that kind of struggle, not on moral grounds alone, but as a social justice issue," says *Without Sanctuary* curator Joseph Jordan. "Her methodology would not only be used throughout the antilynching movement but also in the work of the NAACP and by the civil rights and human rights activists that followed."

"The awful crimes that occurred in this country should not be forgotten," says Tazewell Thompson. "They can still happen today, as the lynching in Jasper, Texas [of James Byrd in 1998], proves." But thanks in part to Wells, the Byrd lynchers were not greeted by cheering crowds or aided by lawmen. They were prosecuted.

No letter pleased Ida B. Wells more than the one she received from a Mississippi sharecropper during her antilynching campaign. "The only thing to offer you in your great undertaking [is] prayer," the man wrote. "The words 'God bless her' is written here on every acre of ground and on every doorstep and inside of every home."

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CAROL PRATT/ARENA STAGE, WASHINGTON, D.C.

SECOND NATURE

MORE AND MORE, INNOVATIVE SCIENTISTS ARE TURNING TO THE NATURAL WORLD FOR INSPIRATION . . . AND DESIGN SOLUTIONS

BY JIM ROBBINS

AFTER DONNING WHITE Tyvek suits and slipping plastic booties over our shoes, Jeffrey Turner and I enter a cavernous metal building on a farm outside Montreal. Having never seen a genetically modified animal before, I don't know quite what to expect. The goats I see immediately disarm me with their intensely curious doe eyes. One buckskin-colored nanny with long, floppy ears rears up on her hind legs, begging for a scratch. I'm under strict orders, however, not to touch her or any of the others because I might inadvertently pass along germs that could make them sick. That would not be good—these animals represent more than $20 million in research. In a feat of technical wizardry, biotechnicians have inserted genetically modified fertilized eggs into the

Got milk? Entrepreneur Jeffrey Turner does, and he's betting that golden orb weaver spider genes inserted into goats will yield milk laced with valuable spider silk.

goats' wombs. Their offspring will carry a silk-producing gene from a golden orb weaver spider in their genetic libraries. Turner expects that milk from these goats will contain the essence of spider webs. Move over, Spider-Man.

Turner, a molecular biologist and the president and CEO of Nexia Biotechnologies, Inc., is betting his career and a great deal of money that these animals will make history. While they may never be as famous as Dolly, the sheep cloned by Ian Wilmut of the Roslin Institute in Scotland, they could prove far more lucrative. Pound for pound, the gossamer silk threads created by orb weaver spiders are five times stronger than steel. One day spider silk might be found in everything from air bags, fishing line and non-tear sports jerseys to ophthalmic sutures and artificial tendons.

The quest to harvest spider silk is one of the latest and most promising experiments in biomimicry, a burgeoning field in which scientists and designers alike mine nature for solutions to all sorts of problems. Says Janine Benyus, a science writer who popularized the term biomimicry in her 1997 book of the same name: "Unlike the Industrial Revolution, the Biomimicry Revolution introduces an era based not on what we can *extract* from nature, but on what we can *learn* from her." Biomimicry has the potential to make products cheaper, better, more efficient and ecologically friendlier.

Human engineers, of course, have always looked to nature for inspiration. "Human ingenuity may make various inventions," Leonardo da Vinci wrote in the 16th century, "but it will never devise any inventions more beautiful, nor more simple, nor more to the purpose than Nature does; because in her inventions nothing is wanting and nothing is superfluous." Witness the multifrequency echolocation system of the bat, which enables it to navigate in pitch darkness at breakneck speeds, or the remarkable stamina of the arctic tern, which migrates 22,000 miles a year.

The most significant biomimicry breakthroughs have come not from merely copying nature, however, but from learning the principles and mechanics behind natural systems and then applying them to human needs. In fact, direct copying of biological organisms can lead to poor, or even disastrous, engineering designs. Consider all the failed attempts humans made to fly by building contraptions with flapping wings. The Wright brothers found success not by replicating the motions of a bird but by discerning the subtleties of lift and stability in the action of a bird's wing and translating them to a fixed-winged craft. "My observations of the flight of buzzards," wrote Wilbur Wright to engineer Octave Chanute in 1900, "lead me to believe that they regain their lateral balance, when partly overturned by a gust of wind, by a torsion of the tips of their wings." Says Robert J. Full, a biologist at the University of California at Berkeley, "This is biological inspiration, not direct copying from nature. I can't fly across the country on a bird—planes are pretty good."

Likewise, inspired by a shrubby tree found in Texas, entrepreneur Michael Kelly filed a patent for barbed wire in 1868. He had observed that farmers would install thorny plants to contain their animals in areas where wood for fencing was in short supply. But the plants took a long time to grow and weren't portable. So Kelly decided to give "fences of wire a character approximating . . . that of a thorn-hedge," mimicking the barbs on the Osage orange tree. Like the Wright airplane, it was not strict emulation: the angle of the thorns was not the same, and the wire was more vine than tree branch. But it worked. (Today, more than 100,000 tons of barbed wire are sold in the United States alone each year.)

So, too, the mandibles of the larvae of a wood-boring beetle became the model for the teeth of one modern chain saw design. And, in perhaps the most well-known example of biomimicry, Swiss engineer George de Mestral, in the early 1940s, drew inspiration from the annoying cocklebur that stuck tenaciously to his hiking pants and to the hair of his dog, to come up with the Velcro fastener, a product in which one surface, consisting of many small hooks, secures to another covered with loops. It became commercially feasible when engineers designed machines

Scientists are using split ends of hairs on the toe (top) of the sure-footed gecko as models for a new type of reusable adhesive tape.

ANNE PEATTIE & KELLAR AUTUMN/LEWIS & CLARK COLLEGE; MIKE SEVERNS;
P. 78 CAROLYN CHATTERTON; P. 79 CARL D. WALSH/AURORA; P. 80 MIKE SEVERNS

that could shape nylon into masses of small, flexible hooks that do not lose their shape.

More recently, in 1995, Ray Anderson, president of Interface, one of the world's largest commercial carpet companies, turned to David Oakey Designs, a textile design company near Atlanta that now specializes in biomimicry, to create carpeting that would be more environmentally friendly. Prompted by Anderson's interest in biomimicry, Oakey asked his designers a series of provocative questions: "Can you [color] it without dye, but with refraction, like the feather of a bird? Can you make it like a snakeskin, where instead of taking out the whole carpet you take a sliver off the top and replace [just] that?"

Answering questions such as these led Oakey and Interface to develop Entropy, a carpet that mimics the randomness of the forest floor with small sections, or tiles, each composed of different shades of color. Because color matching is no longer a problem, only a worn or damaged section needs replacement.

Tufts' David Kaplan grows artificial ligaments by immersing braided silkworm silk in bioreactors (left), which contain fluids that promote tissue growth.

STILL, MUCH OF THE NATURAL WORLD has been inaccessible to scientists because its mechanics are so complex and take place on such a small scale. It's one thing to apply the lessons of a thorny bush, another to understand how a hawk's biological clock tells it to fly south for the winter.

"There is no assembly plant so delicate, versatile and adaptive as the cell," writes Philip Ball, a consulting editor for the British science journal *Nature*. But as we press more confidently into the inner workings of DNA and the proteins that control so many of the processes of the human body, our ability to reap new harvests from the natural world will grow significantly. Promising new commercial and military technologies—in aerospace materials, smart sensors and robotics—have applications far beyond what we see in nature.

Researchers at the University of California at Berkeley and Stanford University, for example, have focused on the small hairs on the antennules of the spiny lobster, which are sensitive to smells in shallow, turbulent waters. Using lasers, dye and high-speed video, they discovered that the small hairs trap part of an "odor plume" in the water. A rapid flick of the antennule by the lobster clears the hairs and captures a new set of data. Thus, a series of quick flicks gives a lobster useful information about the odors in the water around it, even as the water—and odors—speed by. The researchers are studying how the lobster determines the location of the odor source. "The lobster had millions of years to learn how to accomplish an exceedingly difficult task with relative efficiency," says researcher John Crimaldi, now at the University of Colorado. Keith Ward, chair of the Office of Naval Research's Biomolecular and Biosystems Science and Technology Group, says he expects the research to lead to sensors that the Navy can use to locate and identify unexploded ordnance and chemical weapons in shallow marine waters.

While lobsters may provide clues to building smell sensors, a parasitic fly is a source of inspiration for designing better hearing aids. At first sight, the Ormia fly appears quite unremarkable, a yellowish housefly that deposits its larvae on the bodies of living crickets. Researchers at the State University of New York at Binghamton and Cornell University have discovered, however, that the fly locates crickets by tracking their chirping sounds, using the equivalent of directional microphones. The fly's hearing organ is so effective that it could provide a model for making tiny hearing aids with improved directional capabilities.

Then there's the gecko, the lizard capable of bounding across walls and ceilings with speed and confidence. Berkeley's Robert Full studies the microscopic hairs on the gecko's toes, which adhere to surfaces through molecular

MARNIE CRAWFORD SAMUELSON (2)

Burrs sticking to dog fur (above) inspired a Swiss engineer six decades ago to invent Velcro fasteners, now used in thousands of everyday applications.

BRECK P. KENT/ANIMALS ANIMALS; MECKES/OTTAWA/PHOTO RESEARCHERS

interactions known as van der Waals forces. Although these individual attractions are weak, the combined adhesion of the billion split ends on the feet of a single gecko could theoretically support a 60-pound weight. Full believes that this effect can be harnessed to create an adhesive tape that could be used again and again. Similarly, scientists are studying the mussel, which uses proteins to make a glue so effective that it bonds the bivalve to rocks, even in cold seawater. Such a glue could be used for everything from surgical adhesives to ship repair.

One biomimicry product to come to market recently is Lotusan, a silicone-based paint inspired by the lotus plant. Although the plant grows in mucky swamps around the world, its leaves remain clean and dry—dirt and water simply do not stick to them. The German manufacturer of Lotusan claims that the house paint will repel dirt like the lotus and needs only a light washing with water. The microscopic surfaces of both the dried paint and the lotus leaf resemble jagged mountainous terrain, which repel dirty water because the contact area is reduced.

BUT THERE MAY BE NO BETTER EXAMPLE OF NATURE'S ELEgance and efficiency than the silk in a spider's web. In his cubbyhole office at the University of Wyoming in Laramie, molecular biologist Randy Lewis displays a computerized anatomical drawing of the golden orb weaver spider. Each of six separate sets of glands in the spider's abdomen produces a different protein solution, or dope, which the spider forces through spinnerets to produce six kinds of silk: one for wrapping eggs; another to secure prey; three for building a web; and, strongest of all, dragline silk, which a spider uses to hang from a ceiling or branch and for the structure of its web. "Dragline silk is the strongest material ever made by an animal," says Lewis, a leading expert on spider genes. In theory, a braided spider silk rope the diameter of a pencil could stop a fighter jet landing on an aircraft carrier. And it is as elastic as nylon. The combination of strength and elasticity allows it to withstand an impact five times more powerful than can Kevlar, the synthetic fiber used in bulletproof vests.

But harvesting spider silk is not a job for Little Miss Muffet. "Everyone has tried to farm spiders," says Nexia's Turner, "but no one has been successful." Put spiders together and they end up eating one another. In 1998, Turner learned that Lewis and others had isolated the genes for spider silk. Aware that researchers had used the lactation system of goats to produce medicines, he wondered why a goat couldn't also make spider silk in its milk. After all, the gland that produces silk in a spider is similar to that which produces milk in a goat. "So I called up Randy to help us with the golden orb weaver genes," Turner recalls.

Nexia technicians began by removing hundreds of fertilized eggs from several dozen goats. The researchers then inserted spider silk genes into the fertilized eggs and returned them to the goats. As the first of the resulting females become mothers themselves this summer, Nexia technicians will skim and concentrate their milk, which at this stage will look like maple syrup. Up to this point, Nexia will not have done anything so revolutionary. "Mimicking what the spider does is the hard part," says Turner. In its spinnerets, a spider somehow turns the liquid dope into silk of a perfect consistency—not too wet or brittle but strong and super elastic.

Turner volunteers only the barest details about how Nexia and its collaborator, the U.S. Army Soldier Biological Chemical Command in Natick, Massachusetts, force the spider dope through a syringelike apparatus to create long monofilament fibers that can be braided or woven. In preliminary tests of silk produced by isolated cells in the lab, Nexia has created silk with many properties comparable to natural spider silk. But, Turner admits, it has only 30 per-

The same viscous saliva that protects a giraffe's tongue from injury by tree thorns may lead to a new type of water-based lubricant.

cent of the natural fiber's strength. Still, he is optimistic that he can make the fiber stronger, and he says he will patent the process in the next several years.

SUCH FUNDAMENTAL TINKERING IS NOT WITHOUT CONtroversy, of course. "There's this simpleminded notion that you're dealing with Lego blocks and if you pull one out and put it somewhere else, you know exactly what you are doing," says Ruth Hubbard, a professor emerita of biology at Harvard and a founder of the Council for Responsible Genetics. "But it's unpredictable, and it's naive to think you can predict exactly what will happen. I always ask 'Why are we doing this?' If there's a good reason for doing it, and it's done carefully, it's OK. If it's just another way of making money, I don't think it's worth taking the chances."

But there's more than one way to skin a cat—or mimic spider silk. David Kaplan, a professor of chemical and biological engineering at Tufts who has studied biological silk for years, has high hopes for braided silkworm silk. While it is not as strong as spiders', he says, it can be used in biomedical materials relatively quickly and is commercially available in large quantities.

In his Tufts laboratory, Kaplan shows me a large, shallow metal box, called a winding tray, that looks something like the inside of a grand piano and holds a dozen tiny electrical motors. Taut four-foot-long fibers, each composed of ten strands of silkworm silk, are affixed to the motors at each end of the tray. A computer programs each motor to wind fibers with a different number of twists per inch, giving each fiber a different strength and elasticity. "You can get whatever properties you need if you bundle it and cable it the right way," Kaplan says.

He believes that human tissue will grow around the fibers to create new ligaments. Though he is concentrating on making an artificial alternative to the anterior cruciate ligament, the knee tissue that is a problem for many athletes, "in theory it could be used for any tendon or ligament, as well as other tissues," he says. Human trials are between one and three years away.

Society may decide to embrace genetic engineering or it may reject it as too dangerous. But in either case, the natural world will continue to inspire designers, scientists and other innovators. As I stood in the hallway of the kid nursery at Nexia's farm and came to grips with the idea that frolicking goats like these might someday produce the raw material of bulletproof vests, the possibilities of biomimicry seemed limitless. As scientists peer more deeply into nature for inspiration, who knows what products will emerge to change the course of our lives.

Jim Robbins, who lives in Helena, Montana, wrote A Symphony in the Brain: The Evolution of the New Brain Wave Biofeedback.

ROLF VENNENBERND/AFP/CORBIS

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ROMANCING THE STONES

WHO BUILT THE GREAT MEGALITHS AND STONE CIRCLES OF GREAT BRITAIN, AND WHY? RESEARCHERS CONTINUE TO PUZZLE—AND MARVEL—OVER THESE AGE-OLD QUESTIONS

BY DAVID ROBERTS ◆ PHOTOGRAPHS BY MACDUFF EVERTON

STEADY RAIN FELL DIAGONALLY, DRIVEN by a raw wind out of the north, and I narrowed the hood of my parka. With neither tent nor bag, I faced an unpleasant night on southern England's Salisbury Plain. At least my vigil would not be solitary. Around me a boisterous crowd of some 7,000 was camped on the turf at Stonehenge, the enigmatic circle of towering sandstone slabs capped with heavy lintels, whose origins lie in the Neolithic age, some 5,000 years ago. "The most celebrated prehistoric monument in the world," the distinguished archaeologist Sir Colin Renfrew called Stonehenge.

In 2000, fifteen years after the British government closed it to large groups of revelers—following desecration of the site and the death by drug overdose of a young woman in 1984—Stonehenge was reopened to groups, and a long tradition of celebrating the summer solstice resumed. Now, as I huddled in my foul-weather gear, I observed an odd assortment—neo-hippies, self-styled latter-day Druids in white cloaks, Goths in black, New Agers of all persuasions, tattooed bikers, drunken "brew crew" louts of the sort that have given English football a bad name, along with suburban-looking fam-

One of the most striking arrays of Neolithic monuments in Britain, the Ring of Brodgar (above) is on the Orkney Islands off the coast of Scotland. Dating from about 2500 B.C., the ring's stones form a perfect circle 340 feet in diameter. (The tallest of the surviving stones is 14 feet high.) A ditch surrounding the ring, dug out of bedrock, is 33 feet wide and 11 feet deep. Archaeologist Colin Renfrew, who partially excavated the site in 1973, estimates the ditch would have required 80,000 man-hours to dig.

Stonehenge, the most complete of all England's stone circles, has drawn worshipers and visitors alike for four millennia. Though carefully studied, both its origins and purpose remain mysteries. In the early 1980s revelers desecrated stones, forcing the government, in 1985, to ban large groups. But in 2000, Stonehenge and its festivals were reopened to a now better-behaved public.

ilies with young kids, and elderly couples. For hours, people played drums, zithers, horns and didgeridoos; hugged the stones, eyes shut in beatific trance; kissed each other as they stood inside the trilithons (as the assemblies of uprights and lintels are called); and danced upon the recumbent boulders. There were drugs, drink and a little nudity, but came a bleak, misty dawn and not one person had been arrested. The celebrants had even picked up their trash.

No matter how much mumbo jumbo gets projected onto Stonehenge, the intensity of the feelings of my fellow campers testifies to the enduring power the austere stone ring exerts upon human souls. Currently, a million visitors a year walk the designated path just outside the stone circle, marveling at the trilithons. Despite a century of serious archaeology, we still have only the foggiest ideas about why and how Stonehenge was built.

FROM CAESAR'S INVASION OF THE BRITISH Isles in 54 B.C., which brought literacy to the country, until the 1130s A.D., Stonehenge went strangely unmentioned in the written record. Yet when Geoffrey of Monmouth set down his pioneering *History of the Kings of Britain* around 1136, he purported to know exactly how the stone circle had come into being. It first had stood "in the remotest confines of Africa," he wrote, "until a race of whimsical Giants transplanted it to Mount Killaraus in Ireland." Then, in A.D. 480, the stones were moved to England.

Over the centuries since, British commentators have attributed the monument variously to Romans, Danes, Phoenicians, Druids, or the denizens of Atlantis—just about everyone but the native Brits themselves. As late as 1960, Richard Atkinson, then the leading expert on Stonehenge, argued passionately that a Mycenaean or Minoan architect must have directed native builders. And in 1966, Gerald Hawkins argued in *Stonehenge Decoded* that the megaliths made up a sophisticated observatory in which the stones served to record solstices and equinoxes and even to predict lunar eclipses. The book was hugely popular, but Hawkins' conclusions have been largely debunked.

Exactly how people with neither metal nor the wheel were capable of quarrying, dressing, transporting and erecting huge stones has been the subject of intense debate for centuries—though an experimental archaeology project in 1994 proved that, with a deft use of sledges, rails, ropes, ramps, pivot blocks and "tilting stones," as few as 100 people would have been needed to move and raise the 40-ton Stonehenge uprights.

FOR ALL ITS INSCRUTABLE MAJESTY, IT would be a mistake to view Stonehenge as one of a kind—an anomalous temple

BOTTOM: GARY TROTTER/EYE UBIQUITOUS/CORBIS

incomprehensibly erected on a treeless heath in the middle of nowhere. All over Western Europe, Neolithic (roughly 4000 to 2000 B.C.) builders constructed startlingly sophisticated monuments: not only stone circles but huge earthworks containing chambered tombs for the dead. Across Britain alone, there are some tens of thousands of ancient sites, each of which has it own unique stamp, its own idiosyncratic mysteries.

Twenty miles north of Stonehenge stands a monument every bit as enigmatic as its more famous rival, and because of its size, possibly more important. Avebury, which dates from about 2600 to 2400 B.C., does not strike the eye at first glance, as Stonehenge does. A town that first sprang up around A.D. 600 sprawls on top of it, and a paved road cuts through it.

Yet Avebury's grandeur slowly unveils itself. More than a thousand feet in diameter and composed of some hundred stones, it is the largest prehistoric stone circle in the world. Those stones that remain standing today are not dressed and squared like the pillars of Stonehenge. Instead, they reflect all the erratic, lumpy glory of nature's fashioning. Avebury's most astonishing feature, however, is a circular ditch that surrounds the stones, fully 25 feet deep and 60 feet wide. Archaeologists suspect that the principal tool used to dig the huge ditch was the red deer antler.

"[I]t does as much exceed in greatness the so reknowned Stonehenge, as a cathedral doeth a parish Church," wrote John Aubrey, the 17th-century antiquarian best known for his gossipy *Brief Lives*. Avebury has never been properly excavated. Its chief 20th-century investigator, an amateur archaeologist named Alexander Keiller (grown rich from the marmalade that bears the family name), "restored" it in the 1920s to the puzzling state in which it languishes today. He set a concrete plinth in the ground wherever he had reason to believe a vanished stone once stood.

Were Avebury and Stonehenge temples of some kind? Did the ring of stones and the banked ditch define a sacred interior space or a place of initiation? Or did they create a space to exclude the nonbelievers? Were "henges"—the term has come to mean a circular earthwork with a ditch inside—buildings, or did they loom instead as roofless pillared assemblages? Another question is why the Salisbury Plain was such an important place. The questions await answers.

Beyond Avebury and Stonehenge the region abounds in prehistoric monuments. In Wiltshire County alone there are 2,300 barrows—linear tombs covered with earthen mounds. West Kennett long barrow lies a mile from the Avebury ring. Archaeologists dug into it as early as 1859, and again in the 1950s. What they unearthed was an exquisitely constructed tomb in the shape of a long passage giving onto small side chambers. Great sarsen stones planted upright defined the grave space, with equally heavy stones set in place as roofing. Within the chambers lay not just simple skeletons but curious, sorted assemblages of human bones.

An even more remarkable monument near Avebury is Silbury Hill, at 130 feet high the largest man-made mound in Europe and long assumed to hide treasure. So far, excavations into the hill have failed to find a single human bone, much less any treasure. Instead, the diggers' shafts and tunnels have revealed a complex set

For most of the past 100 years, modern-day Druids, who date to the late 18th century, have celebrated the summer solstice at Stonehenge. Ancient Druids were priests who flourished in Celtic Britain from perhaps as early as the third century B.C. until the first century A.D. They apparently worshiped many gods in rituals performed near rivers and lakes. Modern Druids claim a link between the ancients and the building of Stonehenge. But recent evidence indicates that construction there began 2,000 years before the rise of Druidism.

ADAM WOOLFITT/CORBIS

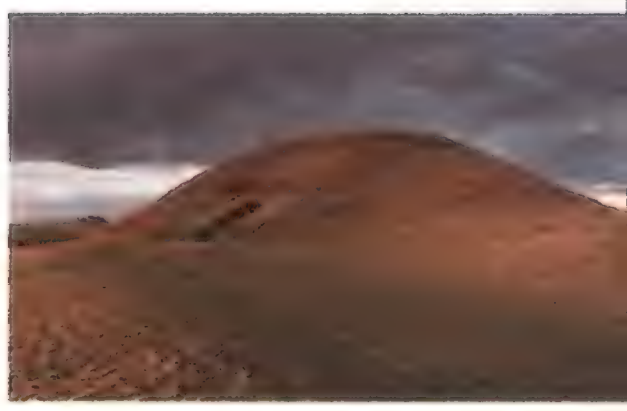
With a diameter of more than a thousand feet, Avebury is the largest stone circle in England. It was constructed between 2600 and 2400 B.C., roughly the time that work on Stonehenge began, 20 miles away. Its surviving original monoliths are unworked stones. When amateur archaeologist Alexander Keiller reconstructed the site in the 1920s, he replaced missing stones with concrete plinths. A settlement from A.D. 600 is now the bustling town of Avebury, with houses, shops and roads scattered among the ancient ruins.

of nested, reinforced walls of chalk rubble and boulders. Is Silbury Hill a tombless pyramid, meant to elevate worshipers toward a godhead in the sky? Whatever its purpose, there is no ignoring the labor its construction required: by one estimate, four million man-hours, or the toil of 300 to 400 men over five years—far more than it took to build Stonehenge and Avebury combined.

FROM WILTSHIRE I HEADED TO THE SINgle most striking arrays of Neolithic monuments in Britain, in the remote, sandstone-rich Orkney Islands off the Scottish coast. On a narrow isthmus of land between two sizable lakes, smack in the center of the main island, called Mainland, lurk the remains of two great stone circles, the rings of Brodgar and Stenness. However ruined they may be (only four of Stenness' monoliths—large single stones—still stand), I found these two monuments the most haunting of all—thanks in part to their setting, in a sheltered bowl in the heart of the wind-lashed archipelago surrounded by rippling lakes, and in part to the soaring thinness of the tallest stones. Neither ring has been fully excavated, but both antedate the stones of Stonehenge.

Half a mile east of Stenness, a smooth grassy mound rises up from the level pasture around it. Weeds and buttercups cover Maes Howe, the finest chambered tomb in Britain. I crawled on hands and knees 30 feet through the gently inclined tunnel, lined with massive slabs exquisitely dressed and fitted, that leads to the tomb itself. Then I stood up in an inner sanctum roomy enough, at 15 feet square by 15 feet high, to house a small town meeting. The walls are built of indigenous flagstone, masoned by a master hand. It was through the roof in A.D. 1153, according to legend, that a band of Vikings seeking refuge in a bad storm broke in to Maes Howe. As they idled in the dank chamber, the Norsemen carved on the walls. These well-preserved graffiti amount to the single largest collection of Norse runes ever found.

Magnificent though it is, Maes Howe is far from unique. In fact, 86 chambered tombs, mostly unexcavated, have been identified at Orkney. From those that



The finest chambered tomb in Britain, Maes Howe rises from a level plain in the Orkney Islands. Its architectural sophistication and size make it one of the greatest achievements of Neolithic builders. A 30-foot tunnel lined with massive stone slabs leads from the tomb's entrance to a 15- by 15-foot chamber that has walls of indigenous flagstone. Little is known about the chamber's use, although well-preserved runes on its walls indicate that Norsemen, caught in a storm, bivouacked there during the 12th century.

have been excavated, a puzzling scenario emerges: picture a tableau in which shortly after death a body is deliberately defleshed—either by exposure to predators (as in Tibetan sky burial) or perhaps by priests using knives to carve the flesh from the bones. The skeleton is then disarticulated—broken into its separate bones. These are mingled with the bones of other dead, sorted according to some lost formula, and laid in arcane arrangements inside a chambered tomb, where priests might have performed ritual ceremonies. On the ground within a side chamber of the tomb of Knowe of Yarso on the Isle of Rousay, the first diggers found 17 skulls, their mandibles removed, arranged to face the chamber's center.

I asked David Miles, chief archaeologist of English Heritage, the government agency charged with protecting England's archaeological sites, what purpose such a procedure might have served. "Ancestor worship," he speculated. "The single individual was not so important. The idea of a collective ancestry was. The dead are excarnated—perhaps flesh itself was regarded as dangerous or evil. Then carefully selected collections of bones are used in ceremonies."

Orkney also boasts the single-best-preserved Neolithic village ever found in Britain, Skara Brae, which was first uncovered by a violent storm in 1850. Today the visitor can wander pathways without invading the "houses" themselves, which lie open to the sky. The most surprising aspect of these domiciles is that even the furniture stands in place—stone dressers, hearths, bed platforms, and stools, all arranged in a uniform pattern within each house. At first the houses feel cozy. Then I noticed crawlways between them, a secret chamber in House 1 that could be reached only by crawling under a dresser, bar holes beside doorways to lock houses against intruders and peepholes to spy on outsiders. A tension of distrust seems built into Skara Brae's very architecture. What's more, as experts point out, the houses of the Neolithic denizens strikingly mirror their tombs.

At the same time that archaeologists remain baffled by some of the most basic questions about Neolithic culture—from the language its people spoke to the en-

In 1850, a powerful storm stripped grass and sand from a massive dune known as Skara Brae in the Orkney Islands, revealing the ruins of Neolithic dwellings. Skara Brae, now also the name of the site, is considered one of the oldest Neolithic villages in Scotland and the best-preserved in northern Europe. In its "houses," original stone bed platforms, tables and hearths (like these in House 1, right) are to be found. Tunnel passageways between rooms are similar to those in the ancient village's tombs.

gine that drove the economy—they have wrung a surprisingly rich understanding of daily life from the tombs of Orkney. We know that the adults of that period were not much shorter than today, men averaging 5 feet 7 inches, women 5 feet 3 1/2 inches. They were muscular but prone to broken bones; their teeth were surprisingly free of decay but ground down from grit in their food. The life expectancy was about 35 years. Perhaps one in three babies died in childbirth.

Was Neolithic life, then, nasty, brutish and short? In many ways, certainly; but the scarcity of fortifications and weapons found in the archaeological record suggests that the epoch was relatively peaceful. It's even possible that the act of building massive monuments to ancestors was the glue that held society together.

FOUR YEARS AGO, IN NORFOLK, THE county that juts like a fat paw into the North Sea 120 miles northeast of London, a local beachcomber, John Lorimer, stumbled upon one of the great prehistoric finds of the century—and touched off a furor. Walking the beach near Hunstanton, Lorimer noticed a huge, upside-down tree trunk sprouting from the sand, halfway between the high- and low-tide mark. Then, 25 feet from the stump, he picked up a metal object. A self-taught antiquarian, Lorimer guessed he had found a Bronze Age ax head. An archaeologist proved him right, dating it to 1600-

1400 B.C. A few months later, Lorimer noticed that the upside-down tree trunk had company: three posts sticking several inches out of the sand. On subsequent visits, he found more posts, and soon recognized that they were laid out in a circle, with the tree trunk at the hub.

Lorimer had discovered what the press soon dubbed Seahenge. The first archaeologists to visit the site, scholars from the Norfolk Archaeological and Environment Division in Norwich, knew at once that the post circle was ancient and important. But precisely what it was perplexed them. As early as 1925, evidence of henges made of wood—entirely vanished today—was discovered from the air by patterns of posthole rings in the ground. (Stone-

Preserved for 4,000 years under a layer of peat moss, "Seahenge" (captured on a postcard) is the only Bronze Age, timber ritual structure to be found intact. It appeared near Norfolk County, England, in 1998, after North Sea tides uncovered it. The next year, archaeologists determined that the inverted oak stump and timbers were too fragile to remain at the site and removed them to a nearby research lab.

henge itself, experts later concluded, had been made of timber a thousand years before the stone trilithons were raised.) Never before, however, had any original timbers been found. Seahenge was that rarest of things—an apparent wooden henge with wood intact, miraculously preserved by the deep bed of peat that lay above it. A dendrochronologist cut a wedge out of the central inverted oak and, using the most advanced radiocarbon dating techniques, came up with a date that is stunningly accurate—the central oak and posts were felled in 2049 B.C.

Evaluating the site in 1998, the Norwich team determined that Seahenge was in immediate danger due to the erosion of the protective peat. Though the policy of English Heritage is to leave artifacts where they are found, the urgency of the perceived threat led to a decision to remove the timbers. But as archaeologists prepared to do so in May 1999, all hell broke loose. Some of the same New Agers and neo-Druids who would celebrate the solstice with me at Stonehenge flocked to the Seahenge beach, determined to block the excavation. They were joined by locals who also felt that the timbers should be left in place. "There was lots of verbal abuse," Maisie Taylor, a specialist in waterlogged archaeological sites, recalls. "The young archaeologists took the worst of it. We had hate mail and even death threats. Eventually we had to have police protection." Ultimately, the excavation went forward. Slowly, as each high tide brought with it muck and sand, the team, led by archaeologist Mark Brennand, made some intriguing discoveries. Bronze Age axmen (or women) had cut notches into the trunk of the giant oak stump, most likely to keep it from slipping when maneuvering it with a rope. Indeed, rope fragments, unbelievably still in place, proved to be braided of honeysuckle; nothing like them had ever before been found. As for the ellipse of timbers, from 15 to 18 feet across, it turned out not to be a henge at all. There was no trace of a surrounding ditch, and the timbers stood tight to one another like a palisade, with no apparent doorway. (Brennand thinks a single forked post may have served as the entryway; initiates would have had to clamber through the forked V to get inside.) Finally, in August 1999, the last post was taken out of the sand. Each timber was carried by military stretcher to a trailer and driven to Flag Fen laboratory in Peterborough, where all 55 of them were submerged in preservation tanks filled with constantly moving water.

Archaeologist Maisie Taylor gave me a tour of the Flag Fen facility, which is open to the public. Delicately, she lifted one six-foot log out of the water and held it for my perusal. I was instantly struck by the ax marks that had trimmed it—the first evidence of tool use ever found in Britain. "What little Bronze Age woodworking we've ever seen demonstrates an amazing sophistication," Taylor said. Using state-of-the-art laser-scanning techniques, experts identified the "fingerprints" of some 38 different axes that, remarkably, had been used to hew the timbers of Seahenge.

Taylor invited me to touch the log. It felt like a cooked mushroom. "You could take it out with your fingernail," she said, putting it back in the water. Once the timbers have been studied, they will be sprayed with fixative chemicals.

In the meantime, the Seahenge discovery underscores the notion that for all the permanence of stone monuments, equally magnificent monuments crafted out of wood once spread from one end of

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Want to see Stonehenge now, before the highways and parking lot that crowd it are gone?

"A NATIONAL DISGRACE" is how one House of Commons committee report described the current surroundings of Stonehenge. Although the ancient structure is a UNESCO World Heritage Site, it is hemmed in by two noisy highways, one barely 180 feet from the stone ring itself. The government's ambitious plan is to divert one highway through a long tunnel under the site and reroute the other. An elaborate new visitors center and parking lot will be well out of view a mile away, and by 2010 the entire Stonehenge area will be relandscaped and restored to resemble its pre-20th-century appearance.

INFORMATIVE WEB SITES are offered by English Heritage (www.english-heritage.org.uk) and the Orkney Archaeological Trust (www.oat.org.uk). Mini guidebooks and advice from travelers who have recently visited are available at www.lonelyplanet.com.

◆ **INSIDE TIP:** Arrange—as far in advance as possible—a private tour of Stonehenge through the English Heritage Web site or by calling 011-44-1980-626267.

◆ **CHOICE COLLECTIBLE:** Intriguing New Age, Druid and other spiritual tchotchkes can be purchased at a little shop in Avebury called The Henge.

◆ **YOU SHOULD KNOW:** Unless you'd like the company of spiritualist and "brew crew" legions, avoid visiting Stonehenge on or near the summer solstice (about June 22).

◆ **FOR THE GOURMAND:** In the Avebury area, ask for a Wiltshire Lardy, a favorite fruit-filled pastry. Lowly fish-and-chip shops in the Orkney Islands are striving to make a palatable haggis, the infamous Scottish dish of sheep innards stuffed into a stomach casing and boiled. They deep-fry it and serve it with generous portions of tatties and neeps (mashed potatoes and turnips), all topped by dollops of butter, heavily sprinkled with pepper. And Aberdeen Angus beef is superb. Try a steak stuffed with queenies—as the Islands' large, juicy scallops are called—and flamed in whiskey.

Britain to the other: wooden tombs, timber circles, standing timbers carved with intricate designs—all vanished but for their vacant postholes.

ALMOST A YEAR AFTER TAYLOR AND HER group excavated Seahenge, I drove up the Norfolk coast to talk to local villagers about the excavation. "I played on that beach when I was 8 or 9; I'm 68 now," retired builder and fisherman Geoffrey Needham told me between sips of lager at the Whitehorse Pub in Holme-next-the-Sea. "As long as I can remember, that big oak stump has been sticking out. They should have left it. The shifting sands would have covered it up. It would come and go as always." Needham showed me a postcard of Seahenge made from a photograph taken by his sister Wendy George that he said many of the protesters still carry with them like a talisman.

Back in London, I told English Heritage's David Miles about my conversation in the pub. Miles said he thought it unlikely that Needham could have seen the oak stump as a child; the timbers were exposed only a few years ago. (In all likelihood Seahenge had been built some distance inland. Four thousand years of eroding, crashing waves had brought the seashore to the monument.)

"I see it as a sacred space," Miles went on. "There are anthropological parallels in which an upside-down tree serves as a channel into the underworld and the heavens. Trees blasted by lightning were said to be 'chosen by the gods.'" Miles looked at the postcard, then smiled a rueful smile common to archaeologists confronted by mysteries about the past. "But of course we really don't know."

David Roberts' most recent book is True Summit: What Really Happened on the Legendary Ascent of Annapurna *(Simon & Schuster). Macduff Everton specializes in anthropological and archaeological photography, especially panoramas.*

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Getting TO THE Root OF Ginseng

BY DAVID TAYLOR

PHOTOGRAPHS BY KEN SHERMAN

QUESTIONS ABOUT THE HERB'S HEALTH BENEFITS HAVEN'T COOLED THE RED-HOT MARKET IN WILD AMERICAN GINSENG

THE APPALACHIAN FORESTS OF southern West Virginia yield all manner of earthly delights: the blush of a rare orchid in the leaf litter, the earthy fragrance of a truffle. But as George Albright leads me up yet another rise and sweat collects on my brow, I fear we may be on a fool's errand. We seek something in these woods that's rarer and more valuable than any of the above: wild American ginseng root.

Because wild ginseng is so valuable—and because poachers have turned it into something of an endangered species—Albright has sworn me to secrecy about where we are, not that I have the vaguest notion anyway. The former mine engineer has walked these woods all his life, but I'm lost minutes after we crest the first ridge behind his house.

Across the valley at our backs, the sound of a coal-laden freight train echoes in the morning air. The forest of poplar, beech and hickory is deep green from weeks of heavy rains. Several plants in these woods resemble ginseng, so our task is not easy. Albright stops for a moment, leans over and pulls a stringy green plant from the soft earth. He wipes the severed root against my wrist, and little scarlet drops spread across it. "That's bloodroot," he says. "When you find this growing, you know the soil's ideal for ginseng." As we walk on, Albright says that "sang," as ginseng is known here, also likes the heavy shade we're in.

American ginseng—whether wild (above, in an 18th-century engraving) or cultivated (for sale at right in New York)—commands higher prices than Asian varieties.

Sang, or *Panax quinquefolius*, is the American version of Asian ginseng (*P. ginseng*), which the Chinese have used to treat a wide variety of ills for several thousand years. In Chinese medicine, Asian ginseng is considered "hot" (a mild stimulant), while its American cousin is "cool" (a calming tonic). Both contain compounds known as ginsenosides, but in different proportions.

Over the past decade, the price of domesticated ginseng, which is easily cultivated, has plunged to about $15 a pound while the price of the wild variety—West Virginia is one of the nation's leading exporters—has soared, commanding up to $500 a dried pound. "A small bulbous root is what the Chinese look for, a shape that occurs only in the wild," says Fred Hays, director of the West Virginia-based Center for Sus-

GINSENG EMPORIUM

tainable Resources, a nonprofit organization that helps farmers grow ginseng and other native plants. (A gnarly approximation of the human body, achieved only by wild varieties, gives ginseng more therapeutic properties, according to traditional Chinese medicine.) Some people also believe that wild roots contain higher concentrations of ginsenosides than farmed varieties.

As we walk through the woods, Albright points out more good ginseng habitat: deep-brown crumbly soil in which other indicator plants—spicebush, goldenseal and poplar—are growing. Then he kneels once more. "Here," he whispers, pointing to a small, slender stem that branches into four smaller stems about six inches above the soil.

It's a "four-prong," a fine ginseng specimen. Like poison oak, it has clusters of leaves and is not quite a foot high. The four prongs signal that this plant is at least 4 years old.

Albright takes the "sanging hoe" and scrapes the earth gently on either side of the delicate stem to keep the fragile root hairs intact. The six-inch root is oddly twisted and bent. It will soon embark on a journey of thousands of miles. U.S. Fish and Wildlife Service inspectors may count its rings to make sure it is old enough before it ends up in a shop in Chungking, China, or San Francisco's Chinatown. By then, it will command several hundred dollars.

Albright grins, not only because he's found the root but also because he planted its seed eight years ago. Wild sang does grow around here, but this particular plant represents his first efforts in the hottest sector of the market today: simulated wild ginseng. Albright says he must harvest this patch soon. Poachers stalk his forest, and, he confides, "somebody already knows that it's here." Some growers are going high-tech, using handheld GPS receivers to mark ginseng patches, thus avoiding using the flags or paint marks on trees that might attract poachers' interest.

Poachers stalk his forest, and, Albright confides, "somebody already knows it's here."

Raw ginseng tastes like a bitter radish, and I can do without it. I've never felt the herb's restorative powers, either, whether it was raw, pickled, dried or powdered. Others certainly have—or think they have. In 1713, Pierre Jartoux, a Jesuit missionary in China, wrote in a letter that after eating ginseng, "I found my Pulse much fuller and quicker, I had an Appetite, and found myself much more vigorous."

When wild American ginseng sprouts red berries, in late August, it is ready to harvest.

Four days later, so tired he could hardly stay in his saddle, he chewed some more. After an hour, he reported feeling like a new man. In his letter, almost as an afterthought, he noted that ginseng might well grow in similar environments, such as Canada.

By chance, Jartoux's letter came to the attention of a Jesuit brother visiting Quebec. An amateur medical botanist, Joseph François Lafitau soon after discovered a Canadian specimen that matched the plant in Jartoux's drawing. A short time later, Canadian suppliers began shipping tons of it to China, resulting in overharvesting within a few decades. The Chinese began looking to the South for an alternate source.

They found it in southern Appalachia, where the Cherokee were already using ginseng medicinally. The Indians believed that it was sentient, able to make itself invisible to people unworthy of it. They so valued ginseng that they dug up only one in four plants and replenished each harvested root with a bead, a prayer and a new seed. When the Canadian supply faltered, the Cherokee stepped up production. By the 1750s, ports in Virginia and South Carolina were doing a brisk trade in the Cherokee's Appalachian ginseng. Shipped to China, it eclipsed Canadian varieties.

George Washington, conducting a survey of his lands in the autumn of 1784, made note of the trend. "I met numbers of Persons & Pack horses going in with Ginsang; & for salt & other articles at the Markets below," he wrote. The United States had no trade agreements with the Far East or even consulates there, so ginseng traders went through British middlemen.

Nonetheless, two American investors financed a trading ship to sail around South Africa's Cape of Good Hope, a huge gamble at the time for investor and sailor alike. The investors hired a vessel out of Boston, renamed it *Empress of China* and outfitted it to the tune of $120,000, roughly ten times the cost of a cargo ship bound for Europe.

As the copper-bottomed ship lay anchored in New York Harbor, workers packed its hold with 242 casks of ginseng (nearly 30 tons), collected by the ship's surgeon in the mountainous "back park of Virginia." In addition, every officer brought along his own private supply of ginseng to sell in Canton (now Guangzhou).

P. 98 NATURAL HISTORY MUSEUM, LONDON/BRIDGEMAN ART LIBRARY

Even Daniel Boone got into the ginseng trade. In the winter of 1787 he sent a bargeload to market.

Nearing the most dangerous part of the voyage in the rocky Sunda Strait of Indonesia, between Java and Sumatra, the *Empress* had the good luck to meet up with two China-trading French ships, which showed the Yankee greenhorns the way. On August 24, 1784, the American ship's captain noted in his log that he "had the honour of hoisting the first Continentol Flagg Ever Seen or maid Euse of in those Seas."

Cantonese customs officials were at first confused by the newcomers, who did not come bearing gifts. But the officials nevertheless welcomed the "Flowery Flag Devils" (the stars on their flag were mistaken for flowers), most likely because the *Empress* contained so many casks of the fabled root. When the ship returned to the port of New York City that spring, she repaid her investors with a handsome 25 percent profit.

Even Daniel Boone got into the ginseng trade. In the winter of 1787 he sent a bargeload of dried ginseng to market in Philadelphia from his trading post in what is now central West Virginia. On the way, the vessel was swamped, and Boone's ginseng ruined. Unfazed, he sent sangers back into the forest to collect a second bargeload.

In 1859, Minnesota's Big Woods witnessed a ginseng rush. High prices for the root helped many Minnesotans weather tough times brought on by an economic downturn two years earlier. In Mankato that year, a local paper reported that a ginseng dance was planned to make diggers "oblivious to musquito bite or toil of delving for the bulbous root, whilst 'tripping the light fantastic toe' to the music of the Ginseng Polka." Overharvesting soon put an end to Minnesota's ginseng boomlet. About the same time, forward-thinking farmers in neighboring Wisconsin experimented with cultivating the root. Today, the state of Wisconsin ships a half-million pounds of ginseng annually, making it the leading exporter of cultivated ginseng in the United States.

Americans themselves developed a strong appetite for ginseng only in the past decade. In 2001, Americans spent about $170 million on ginseng supplements and products. Its growth in popularity has come despite the lack of scientific proof that ginseng has medicinal powers. Last year at Oregon State University, in a study of ginseng's purported psychological benefits, 83 students participated in a 60-day, placebo-controlled, double-blind, randomized clinical trial. The researchers found that the supplements improved the students' energy no better than sugar pills.

Other studies, however, suggest that ginseng may have some health benefits. In 2001, the National Institutes of Health (NIH), citing a Vancouver study, said that "ginseng does appear to have antioxidant properties." Antioxidants are found in a variety of foods, especially fruits and vegetables, and some lab studies suggest they may help prevent certain types of cancer. (Clinical studies have been inconclusive.) The NIH's National Center for Complementary and Alternative Medicine notes that ginseng "may help the body's disease-fighting and glandular systems."

Two years ago, clinical trials conducted in Toronto, Canada, suggested that American ginseng can lower blood sugar in Type II diabetics. Vladimir Vuksan, the study's lead investigator, says, "We found that what matters is not only the quantity of ginsenosides but the ratio of different ginsenosides that determines the effect on blood glucose." Vuksan, a medical doctor at the University of Toronto's St. Michael's Hospital, cautions that these results are only preliminary.

James Gordon, a professor of psychiatry and family medicine at Georgetown University and one of ginseng's most respected proponents, says ginseng has reduced fatigue and other side effects in his patients going through

Even though George Albright has been digging "sang" in his native West Virginia with a homemade "sanging hoe" since he was 12 years old, he doesn't use ginseng himself.

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Tom Carte's harvest of wild ginseng will net him nearly $200 at Angler's Roost, a sporting goods store in West Virginia.

chemotherapy. "It offers them relief without the agitation caused by other drugs," he says. He also believes that the root can reduce stress and boost the immune system.

"I tell cancer patients they should consult a qualified herbalist," says Gordon. But he warns against over-the-counter ginseng supplements. One recent study by ConsumerLab.com, an independent organization that tests herbal and nutritional supplements, found that only 9 of 22 international ginseng supplements met its criteria for quality and purity; some even contained dangerous amounts of lead and other heavy metals. "The quality and reliability of ginseng supplements is a major problem," says Gordon, who chairs the White House Commission on Complementary and Alternative Medicine Policy. "We're interested in making sure that what's in the bottle is on the bottle."

In the United States, ginseng is second only to gingko as the most popular herbal supplement. It has made its way into a number of products, from teas and chewing gum to tinctures, snack chips and "smart" drinks, which are nutrient-enriched drinks marketed to counter stress. Health claims for ginseng also vary widely—and arouse suspicion from regulators and consumer advocators. Wyeth Consumer Healthcare, one of the largest producers of health care products in the world, claims that its Centrum Herbals Ginseng supplement "helps maintain stamina and energy levels and may enhance physical performance." Marketers of Ginsana, the most popular ginseng supplement, boast that the product will "enhance physical endurance" and "improves oxygen utilization." Other claims include increasing sexual potency, reducing problems associated with menopause and even improving memory.

"What is most striking about ginseng is the amount of misinformation in ads and on packages," says nutritionist David Schardt at the Center for Science in the Public Interest (CSPI). "*Panax ginseng*, the most commonly available type, does not boost energy levels, mood, or memory and doesn't reduce stress."

After reviewing studies over the past two decades, the CSPI asked the Food and Drug Administration three years ago to halt phony claims. During the past two years, the FDA has sent letters to about half a dozen manufacturers, ordering them to limit product health claims due to the lack of evidence to support them.

Ginseng's effectiveness, or its lack thereof, will likely not be definitively determined anytime soon, partly because the traditional underwriters of large-scale clinical studies—pharmaceutical companies—have little incentive to test an ancient nostrum that is already widely sold and largely unpatentable. In the meantime, ginseng's most therapeutic effect may be in breathing economic life into poor, rural communities in the southern Appalachian mountains.

"Ginseng is an economic answer for West Virginia, where things like coal mining are on the way out," says Fred Hays. "A small landowner can sell his lumber and wait a generation for it to grow back," he says, or plant Christmas trees. "But in the same little square that you can grow one little Christmas tree in eight years, you could grow $3,000 to $4,000 worth of ginseng."

Which would make ginseng, cure-all or not, worth rooting for.

David Taylor wrote about the Federal Writers' Project in the March 2000 issue. Photographer Ken Sherman is based in West Virginia.

ILLUSTRATION/PHOTOGRAPH CREDIT CAECILIA ROMAN 5, TRACK 20

PEOPLE FILE

Casting for Souls

A DEDICATED NUN SPARES NOT THE ROD (NOR REEL) IN HELPING YOUNGSTERS STRAIGHTEN UP AND FLY RIGHT

BY KENT BLACK

SISTER CAROL ANNE CORLEY WAS displeased. "Mr. Gary," she called out in a voice that sounded all the more intimidating for its evenness, "would you please ask your young men to step out of the van and line up?"

Brian Gary, who is the size of an NFL lineman and is the director of the Boys Shelter, a juvenile group home in Fort Smith, Arkansas, smacked the side of the van with a ham-size hand, practically setting it on two wheels. "All right, listen up!" he barked at his dozen teen charges. "Get off the bus. I want a single file line. Move it!"

Within a few seconds, all the kids were shuffling across the parking lot. None of them were hard cases; they were just teenagers whose troubles sprang from broken homes, lousy attitudes and too much free time.

Gary had brought them here to the Norfork River in northern Arkansas to learn fly-fishing from Sister Carol Anne Corley and businessman Terry Looper. The pair founded the U.S. Youth Fly-fishing Association in 1999 to interest young people in the sport.

On this afternoon, Sister Carol Anne, 57, is dressed not in a habit but in dark brown neoprene waders and a floppy hat covering her white hair.

"Gentlemen, I hope we all had a good time fishing today," she says, addressing the youths in the parking lot. "And I hope some of you will continue to fish. But first we have a problem we need to solve." She holds up a Sage fishing rod in her right hand. "I have here a rod that was returned without anyone telling us it was broken," she says, frowning. "Now, I know you all feel that if you admit something, you're going to get in trouble. You won't. But I need the person who broke this piece of equipment to step forward. Do you know why? Because this sport isn't just about catching fish. It's about fairness, and sportsmanship and honesty."

"I would pick the woolly bugger if I had to pick just one fly to fish with," says Sister Carol Anne Corley, who can tie 50 flies in a day.

Sister Carol Anne is not exactly a drill sergeant for the Lord, although her nickname at St. Edward Mercy Medical Center in Fort Smith, where she was director of home health care services, was Sister Rambo. When the guilty party finally came forward, she treated him gently but firmly.

A fly-fishing nun is no anomaly. More than 500 years ago, in fact, the first book on the sport, *The Treatyse of Fysshynge with an Angle*, was written by an English nun, Dame Juliana Berners. It describes 12 different flies she cast on streams around the abbey where she lived in Hertfordshire.

Sister Carol Anne believes casting a fly has a spiritual power that rivals prayer, and says that the countless hours she has stood waist-deep in rivers watching trout rise to her flies have enriched her soul. "At times on the river, it *is* prayer," she says. "It is a way of praising God for this incredible gift."

Her passion for the sport caught the attention of the national fly-fishing community, and over the past decade Sister Carol Anne has been a featured attraction at fly-fishing convocations. She is a contributor to the book *A Woman's No Nonsense Guide to Fly Fishing Favorite Waters* and has appeared on the "Late Show with David Letterman."

Carol Anne Corley grew up fishing—with bait. The youngest of five children in a prominent St. Louis family (her grandfather founded the economics department at Washington University), she recalls a "very wholesome and all-American" childhood. Her parents took their rambunctious brood to the country most weekends and often went for aimless drives.

"It wasn't long before we'd find a stream and stop to have our picnic and fish all day," she says. In 1963, at the age of 19, she joined the Sisters of Mercy, a charitable order devoted to health and education ministries, before earning a nursing degree at Marillac College in St.

ALL: WESLEY HITT

"My deal with myself was that I would fish until I lost two flies."

Louis. She took her final vows in 1971.

With each transfer to a different hospital or medical facility, she made a point to learn to fish the way that locals did. "When I was in Texas I would go to the ocean piers and use spinning rods to catch speckled sea trout and redfish," she recalls. "In Louisiana, I went out to Lake Pontchartrain and learned to catch crabs in nets, and when I was in Kansas I fished crappie and perch with a slip bobber."

It was in 1985, while working at St. Edward, that she took up fly-fishing. She bought a fiberglass rod for $19 and a reconditioned reel for $5. Many nights after work she would practice casting at a nearby pond. "My deal with myself was that I would fish until I lost two flies," she says. "On a nun's salary you have to be resourceful."

Her casting style is largely self-taught and unorthodox, but it gets the job done. A couple of years after taking up the sport, she was one of only two women to be invited on a trip with the Fort Smith Flyfishing Club, and she ended up on an unpromising stretch of the Norfork River.

"I started out casting straight in front of me. Wham! I had a big rainbow," she recalls. Over the next hour, she netted and released about 20. "So I turned upstream 45 degrees and wham! I started pulling out brook trout. Then I turned and faced farther upstream and started pulling out cutthroats. Finally, I got so tired I turned all the way downstream and wham! I started catching browns. I got all four trout species, probably more than a hundred fish. It was a grand slam!" Some of her companions suspected divine intervention.

For her, fishing became much more than a diversion after she spent 1993 helping her sister-in-law take care of a brother dying of cancer—the man who taught her to tie flies. Wanting to reaffirm her relationship with God, Sister Carol Anne took a sabbatical and lived for a year at a religious retreat in Louisiana. There she prayed and exercised—and decided to channel her love of fishing and nature into good works.

After the retreat, she approached the principal of a Catholic elementary school in Hot Springs, Arkansas. In no time, she began teaching fly casting for physical education, flytying for art, and even pitched in to assist the science teacher in a water ecology course. Tying flies requires nothing if not patience, a virtue not usually abundant in adolescents, so the experience was try-

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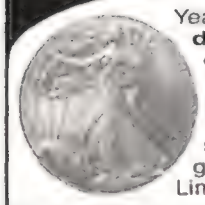

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"Fly casting is more a matter of timing and rhythm than power," Sister Carol Anne Corley (above) tells her young charges.

ing for students and teacher alike. But worth it. "I have always felt strongly that in order for our planet to survive, children need a means of immersing themselves in the middle of God's creation," she says.

Three years ago, Sister Carol Anne was approached by Terry Looper, an air-conditioning contractor, to form the U.S. Youth Flyfishing Association. Since then, the pair has worked with groups such as the Arkansas Baptist Boys' Ranch, in Harrison, Arkansas, the Moffett Baptist Mission in Moffett, Oklahoma, as well as several churches, schools, and the Boy and Girl Scouts.

To be sure, miracles seldom happen. On the winter Saturday that Brian Gary took the Boys Shelter group to the Norfork River, about half the young men sent to Sister Carol Anne for instruction wandered off without trying more than a few token casts. But two of the young men took to fly casting like flies to honey. Each caught a dozen fish in a couple of hours.

"You thank God for the kids you get and you pray for the ones you don't," she says later as she packs up the rods and reels and other gear. "Not all gifts are received equally."

New Mexico-based writer and editor Kent Black last wrote about illegal pothunting.

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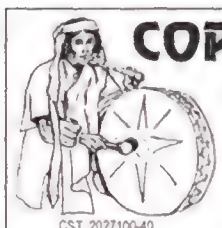

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B O O K S

B O O K S

Cloak and Dollar: A History of American Secret Intelligence

Rhodri Jeffreys-Jones

Yale University Press, $29.95

IN THE MIDST OF A national debate on the failure of our intelligence-gathering establishment to prevent the terrorist attacks of September 11 comes historian Rhodri Jeffreys-Jones' scathing appraisal of American espionage, from the Revolution to the present. The author charges that intelligence agencies have historically "tended to run amok with taxpayers' money," while recent interagency rivalry has undermined effectiveness. This has cost America dearly, a perception made timely by revelations that FBI concerns about Middle Eastern students in U.S. flight schools never registered at the highest levels of the FBI or the CIA.

Jeffreys-Jones, a Welsh-born professor of American history at Scotland's University of Edinburgh and author of two previous books on the CIA, views the intelligence establishment as more proficient at self-promotion than spycraft.

He takes the long view, beginning in the early years of the Republic, when the entire country's population was less than Ireland's and westward settlement did not extend much beyond the Appalachians. In 1792 President George Washington spent no less than $1 million, or 12 percent of the entire federal budget, on what Congress primly called a "contingent

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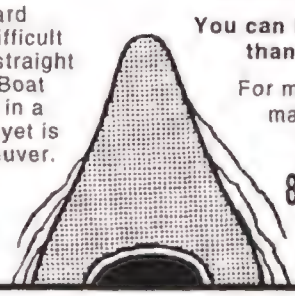

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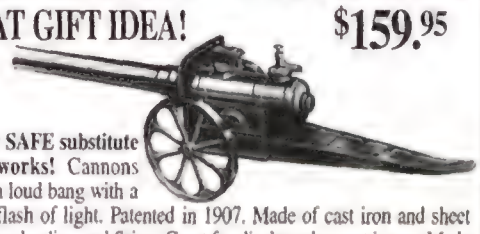

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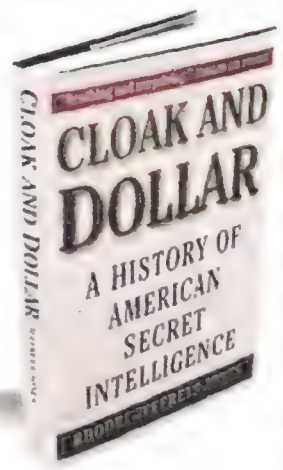
fund of foreign intercourse," that is, espionage, against the British in Canada and Indians to the west.

We meet such half-forgotten figures as Allan Pinkerton, the onetime Scottish radical turned private detective whose undercover operation saved Abraham Lincoln from assassination on his way to his first inauguration in 1861. Pinkerton went on to serve with demonstrable incompetence as chief of intelligence for the Union Army and so grossly inflated the Confederacy's troop strength that he likely helped prolong the war. We also meet the hard-drinking, poker-playing cryptographer H. O. Yardley, who was once honored for cracking the Japanese diplomatic code during the 1920s. Later he sold his skills to the Japanese, possibly contributing to their ability to launch the surprise attack on Pearl Harbor in 1941.



As for the FBI, which got its start investigating land fraud and antitrust cases, it made itself appear indispensable by inventing an epidemic of "white slavery" cases. (The bureau claimed that young American women were being abducted and sold to brothels.) Later the agency tried to discredit Charles Lindbergh, whose isolationist statements threatened to undermine American support for entering World War II, by alleging that he consorted with prostitutes and flew whiskey into the United States from Canada during Prohibition. The episode reminds us that disinformation has always been one of the sharper tools of the spy's tradecraft.

Jeffreys-Jones calls the 1950s "the golden age of operations and hype." From 1949 to 1952 alone, the CIA's covert-action division swelled from 302 to 2,812 staffers. It was a time when CIA officials, "flashing ID cards

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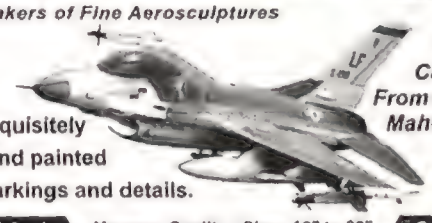

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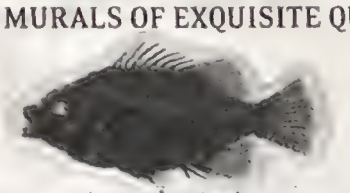

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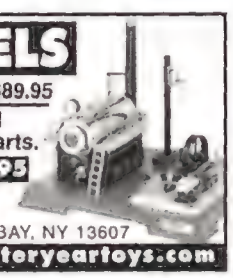

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and looking like they belonged at the Yale Club," routinely debriefed journalists returning from foreign assignments. It was also a time when the CIA engineered the defeat of leftist insurgents in the Philippines and overthrew popular governments in Iran and Guatemala. By 1961, the agency was leading the United States into the Bay of Pigs debacle. (This chapter opens with an account of a 1960 dinner party at which Presidential hopeful John F. Kennedy was heard asking novelist Ian Fleming, creator of James Bond, for ideas on overthrowing Fidel Castro; an amused Fleming suggested shaving Castro's beard off as a way of emasculating him.) Perhaps the agency's most glaring failure, however, was its inability to predict the 1991 collapse of the Soviet Union. Senator Daniel Patrick Moynihan, for example, accused the agency of having overestimated the size of the Soviet economy by 300 percent.

Swashbucklers of the past would no doubt be mortified to know that the once-exclusive, all-male, largely Ivy League men's club that ran the CIA has opened its doors, if grudgingly, to today's more diverse society. In 1995, a woman, Nora Slatkin, was appointed to the number three job at the agency.

After the fall of the Berlin Wall, critics called for reducing the scale of the nation's intelligence services. Today, the events of September 11 have refocused attention on the importance of spycraft to national security. Both the FBI and the CIA are calling for increases in funding. Yet, the author warns, no intelligence agency, however well provided for, can totally guarantee the security of the citizenry it is charged with protecting. Nor, recent developments seem to suggest, can America always count on the competence of its espionage establishment.

Reviewer Fergus M. Bordewich is a journalist who has written widely on foreign affairs.

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The Fly Swatter:
How My Grandfather Made His Way in the World

Nicholas Dawidoff
Pantheon, $26.00

ARRIVING AS AN American immigrant today, Alexander Gerschenkron might find himself driving a taxi. But in an era before the academy succumbed to credentialism, a man like Gerschenkron, possessing a degree in economics—but no doctorate—from the University of Vienna, could still end up a tenured professor at Harvard. There, from the 1950s on, he would influence a generation of economic historians. He would also be offered appointments in Slavic studies and Italian literature (posts he turned down) and teach himself Icelandic for sport. He played chess with artist Marcel Duchamp, flirted with actress Marlene Dietrich and feuded with his colleague John Kenneth Galbraith, among other illustrious adversaries.

Gerschenkron's biographer and grandson, Nicholas Dawidoff, derives his title, *The Fly Swatter*, from his grandfather's tendency to apply ferocious energy, a kind of psychic overkill, to endeavors great or small. Take, for instance, insect control. "Some men just kill a fly," writes Dawidoff. "My grandfather had an arsenal of swatters. . . . [He] never allowed his victims to be cleaned up. He claimed they were deterrents."

Gerschenkron's major contribution to economics was to emphasize the ways in which adversity can be helpful to a country's development, a process that mirrored his own life. He fled the Communists after the Russian revolution of 1917. After remaking himself into a Viennese, he fled the Nazis in 1938 and immigrated to America.

At first, he swept floors and

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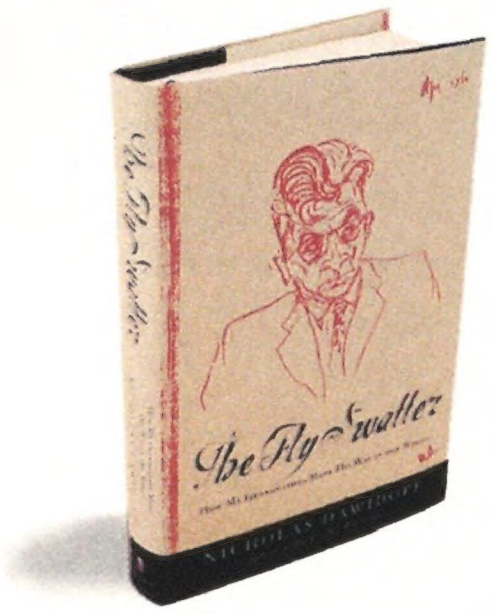

worked in a boatyard, before managing to get hired as a lecturer at Berkeley. In 1948, in his mid-40s he won the Harvard appointment. Determined to demonstrate his singular abilities, the driven instructor commenced a period when he "was sleeping only every other night and inviting those who wanted a word with him to stop by his office at six in the morning."

He gained renown as the rumpled economist who knew "all about everything—German historiography, the emigration theory in Romanian history, the complexities of infinitely divisible time. He understood Kant, Chekhov, Aristotle and Schopenhauer better than people teaching them at Harvard for a living." He had perhaps 20 languages at his command.

Dawidoff's book is both a study of the immigrant experience and a vivid picture of mid-century intellectual life at America's preeminent university. But most of all it is a touching portrait of a complex and staggeringly learned individual, written by one of the few people he allowed to touch his heart. The author, along with his sister and several cousins, spent childhood summers with his grandfather in New Hampshire, sojourns Dawidoff recalls with profound affection: "Each night, without fail, he tucked us all in and slipped us each a piece of unwrapped milk chocolate. He said it was our reward for brushing our teeth."

Reviewer Daniel Akst is based in New York's Hudson Valley.

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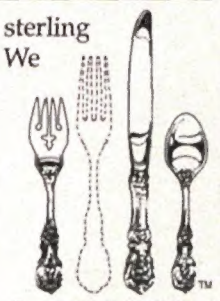

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